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No. 14

Cold Lap in Bronze Castings

APPEARANCE

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CAUSE

Pouring temperature too low.
Low fluidity due to lack of deoxidation.
Aluminium as impurity in bronze or gunmetal.
Insufficient venting of mould or too much gas forming matter in sand.
Faulty gating system causing turbulence.

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Guard against aluminium pick-up in scrap.
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V. C. FAULKNER, F.R.S.A., HON.M.I.B.F.

Assistant Editor: A. R. PARKES, M.I.B.F.
Commercial Editor: P. E. CARDEN

Advertising Manager:
F. BARRINGTON HOOPER, B.A.

Production Manager:
R. J. LOVELL

Publisher: H. J. DWYER
Circulation Manager: E. T. GRIFFITHS

District Representatives:
G. P. ELLIOTT (Northern Area)
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JOHN ADAM HOUSE,
17-19, JOHN ADAM STREET,
ADELPHI, LONDON, W.C.2

Telephone: Trafalgar 6171 (*Private Branch Exchange*)
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PRINCIPAL CONTENTS

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"Gateway to the Future"

This article, as its title suggests, deals in detail with what may be considered a pioneer venture in the field of precision castings. The company in question is Samuel Osborn and Company, Limited, of Sheffield, in whose new Holbrook works the most modern precision-casting techniques have been brought together under one roof to deal with new and complex demands. In this the first part of a comprehensive feature, the general layout of the new works and the highly-organized routing system by which new orders are dealt with are considered together with a number of case-histories of components produced by one or other of the three processes operated 33

Casting a Bronze-age Axehead 53

Making Soft Iron Castings 53

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"Porte ouverte sur l'Avenir." I ère partie.
Cet article, comme le suggère son titre, traite en détail de ce qu'on peut considérer comme une expérience d'avantgarde dans le domaine des moulages de précision. La compagnie en question est la Samuel Osborn & Company de Sheffield: dans leur nouvelle usine de Holbrook les techniques les plus modernes de moulage de précision ont été rassemblées sous le même toit pour répondre à des besoins nouveaux et complexes. Dans cette première partie d'un exposé complet et détaillé, y sont étudiés la disposition générale des nouveaux ateliers et le système hautement organisé qui préside à l'exécution des commandes de la réception à l'expédition 33

"Ein Tor in die Zukunft." Teil I.
Dieser Artikel, wie es sein Titel andeutet, behandelt ausführlich ein als bahnbrechend anzusehendes Unternehmen auf dem Gebiete des Genaugusses. Die Firma ist Samuel Osborn & Company, Limited, Sheffield, in deren neuen Holbrookwerken die modernsten Arbeitsweisen für Genauguss unter einem Dach vereinigt worden sind, um neuen und komplizierten Anforderungen gerecht zu werden. In diesem ersten Teil einer umfassenden Darlegung werden die Gesamtanlage der neuen Werke und das hochorganisierte Laufsystem, das die neu einlangenden Aufträge erfasst, betrachtet 33

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NEW ideas in FOUNDRY PLANNING by

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Picture shows a distributing conveyor, with supply hoppers to moulding machines, and general view of sand preparation plant. The sand preparation plant includes a large reclaimed sand storage hopper, bucket loader, mixer (and dust hood) with discharge direct to distributing conveyor.

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FOUNDRY
TRADE JOURNAL

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Research for Industry

THIS is the title of a publication made by the Department of Scientific and Industrial Research covering work done by industrial grant-aided research associations during the years 1956/57. The foundry industry is either lucky or unfortunate in having at its disposal two "point something" associations working for the improvement in the quality of castings. The two associations are the British Cast Iron Research Association and the British Steel Castings Research Association, whilst the "point something" is the British Non-Ferrous Metals Research Association. This last body has, *inter alia*, to cover brass, bronze and the light alloys. The two associations directly controlled by the foundry industry have a total income of over a quarter of a million pounds, but to this sum must be added the cost of the work done by the BNFMRA.

Both the BCIRA and the BSCRA report on the work being undertaken on moulding sands, the former is ascertaining, by using di-electric heating and a higher powered and increased frequency oscillation, the properties given at the mould face, whilst the latter is making tests on the compaction of sands, which is related to surface finish. This research includes work using moulding machines on the jolt amplitude and squeeze pressure. The results of both these researches will be of equal interest to both steel and iron founders. There is no duplication of effort, but rather the work is complementary. In the report the sole direct section of the BNFMRA relates to work done in connection with BS.1400, "Copper-alloy Ingots and Castings," where the Association was able to show that sulphur had a serious influence on the mechanical strength, pressure-tightness or castability of common phosphor-bronzes, and leaded and lead-free gunmetals. Recommendations based on these results were made to the British Standards Institution.

Each industry is alike cognisant and appreciative of the work done by their own association for their members and their customers. There is, however, too little appreciation of what is to be had from those serving other industries. They are an excellent source of information as to conditions in which castings are expected in the various industries. There are also other phases, such as useful liaison between the National Society of Master Patternmakers and the Research and Development Committee of the Timber Development Association. Some research associations from time to time do work on iron castings, such as the Motor Industry Research Association and the British Internal Combustion Engine Research Association. Intelligently used, the research activities of this country can bestow the greatest benefit on the individual manufacturer and the economy of the industry as a whole.

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International Foundry Congress

A list of the official exchange papers to be presented at the forthcoming International Foundry Congress has already been published in the JOURNAL (April 3, p. 376), and below are detailed the rest of the papers, emanating from private sources.

"Human Relations in Industry: Sociology and Empiricism," by Mr. Perry; "Men and Work in the Foundry," by Dr. H. Scholz; "Current Foundry Research Tendencies," by Mr. G. Blanc; "Ladle Additions in Ironfounding," by Professor Patterson; "Grain-size of Grey Iron," by Mr. J. S. Abcouwer; "Correlation of Service Performance with the Metallographic Structure of Castings," by Professor R. A. Flinn; "Improvement of Iron and Steel by Copper Additions," by Mr. R. Coussement; "Manufacture and Use of a Cobalt Alloy," by Mr. P. Van Bleyenberghe; "Use of Various Deoxidizers in Cast Steel," by Mr. C. E. Sims and Mr. C. W. Briggs; "Magnetic Control of Castings," by Mr. A. Karamara; "Properties of Copper-base Alloy Castings," by Mr. F. Hudson, Mr. D. R. Wood and Mr. J. F. Gregg; "New Aluminium Alloy of the Al, Zn, Si, Mg-type," by Dr. W. Thury; "Effect of Various Factors on the Mechanical Properties of Magnesium-alloy Castings," by Mr. J. W. Meyer; "Improvement of Relations between the Foundryman and the Engineer," by Mr. Imberty; "Application of Atmospheric Exothermic Feeder-heads to the Production of Steel Castings," by Mr. E. Ney; "Influence of Metal Streams on Mould Surfaces," by Professor J. Szreniawski; "Mould Finish and Casting Surfaces," by Mr. P. Schneider; "Determination of Runner Sizes for Castings of all Shapes and Sizes in Normal Cast Irons and All Types of Sand," by Mr. C. Trenckle; Calculation of Pressures produced during Casting on Mould Walls and Cores," by Mr. R. Namur; "Seizing," by Mr. J. Léonard; "Properties and Testing of Materials used in the CO_2 Process," by Mr. D. A. Taylor; "Cold- and Hot-strength of Moulding Sands, Core-sands and Chaplets," by Mr. R. Collette, Mr. R. Gaty, and Mr. R. Namur; "Critical Examination of the Behaviour of Chaplets," by Mr. F. Kinet and Mr. Y. Lamoureux; "Recent Advances in Magnesium Casting-alloy Technology," by Dr. E. F. Emley; "Cupola Spark-arrestors," by Mr. R. Goenaga; and "Researches on Basic Refractories for Cupola Work," by Dr. M. B. Sochor.

Dinner

WORSHIPFUL COMPANY OF FOUNDERS

The Worshipful Company of Founders held their annual ladies' dinner at the Livery Hall of Guildhall on July 2. The Master, the Rev. R. B. R. Walker, B.A., presided. Accompanying him at the high table were: Major L. E. Cotterell, T.D.; Mr. A. S. Young; Alderman Sir Frederick M. Wells, Bt; Mr. A. G. Young, C.C.; Mr. J. A. Taylor; Mr. J. L. Wheeler; Mr. W. G. Fossick; Captain (E) W. Gregson, C.B.E., R.N.R.; Mr. K. H. Adams; Mr. E. W. Moss; and Mr. C. Little Smith, most of whom were accompanied by their ladies. The best speech of the evening was made by Mrs. U. E. L. Walker, the wife of the Master. The stewards for the occasion were Mr. V. C. Faulkner and Mr. Brian H. Colquhoun, B.SC. The function was, as is usual, brilliantly organized by the Clerk, Mr. H. Wilson Wiley, M.A., assisted by the Beadle, Mr. Fountain.

Swedish Foundry Medal Awards

From May 31 to June 2, the *Sveriges Gjutmästareförbund-Gjuteriteknisk Förening* (the Swedish Foundrymen's Association) celebrated its 50th anniversary with a meeting in Gothenburg attended by about 450 persons, among whom were several guests from the other Scandinavian countries.

The president of the association, Mr. Erik O. Lissell, in his address of welcome, gave some details from the history of the Association. It was founded in Gothenburg on the initiative of a small local association of foundrymen there and has since grown to its present membership of about 900. Its chief aim has always been to raise the standard of the foundry industry by technical activity, but at the same time, during the first decades, one of the main purposes of the Association was also to look after the economic interests of foundrymen.

One of the outstanding features of the celebration was the awarding of a new foundry medal, the *Edholmsmedaljen*, to two of the most prominent members of the Association, *i.e.* Mr. Yngve Granström,

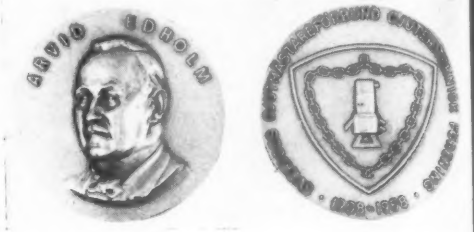


FIG. 1.—*Obverse and reverse of the new Foundry Medal of the Swedish Foundrymen's Association, this year awarded to Y. Granström and K. G. Westin.*

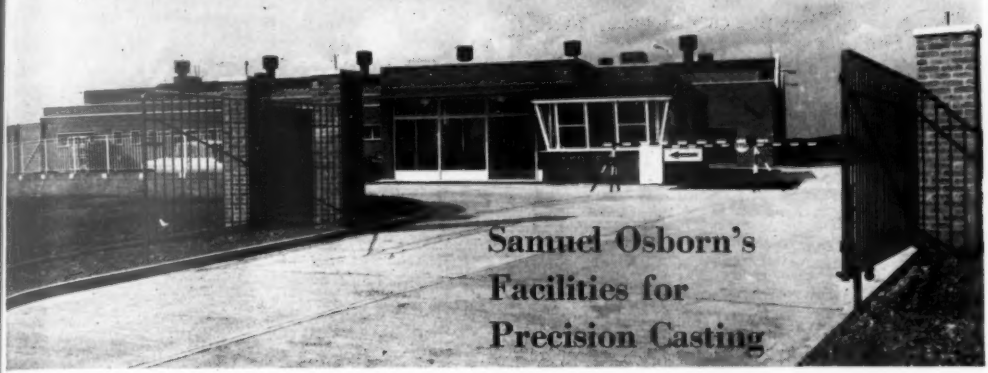
ASEA, Västeras, who is well known to foundrymen in most countries from his presidency, in 1955, of the International Committee of Foundry Technical Associations, and to Mr. K. G. Westin, Westin & Backlund Company, in Stockholm, who has been one of the leading personalities within the Association from its beginning, and whose company has pioneered many foundry machines for the benefit of the foundry industry. Mr. Arvid Edholm, whose name gives honour to the gold medal, was one of the founder members of the Association and was its president from 1908, to his death in 1929.

The festival lecture of the congress was given by Mr. Sven Toresson, AB Götaverken, Gothenburg, who chose the interesting subject of the foundry industry in the atomic age. A large foundry exhibition was held in conjunction with the congress. Actually 27 firms had arranged most interesting exhibits of foundry machines and plant of all kinds.

Electric Furnaces to be Manufactured in SA

As a result of the growth in the demand for electric furnaces, a local factory is now being built at Springs by the Russ organization to cater for the African market. It is proposed to build locally a full range of electric furnaces of all types and to distribute these through the sole selling agents, Forest Engineering (Pty.), Limited, Johannesburg.

"GATEWAY TO THE FUTURE"



Samuel Osborn's Facilities for Precision Casting

The Holbrook Steel Works of Samuel Osborn & Company, Limited, Sheffield, were officially opened last month. The new works have been built so that production of steel and highly-alloyed castings of small size can be divorced from the normal foundry procedures and techniques, as typified by operations carried on in the Group's foundry (Osborn Foundry & Engineering Company, Limited), at Wicker, Sheffield. Thus, the purpose of the new establishment is to produce high-quality castings in a wide range of alloys by the precision methods—shell-moulding, Osborn/Shaw and CO_2 processes. The Holbrook works have been laid out for production by all three processes and this account gives first a description of the layout and flow-production schemes by which various processes are operated, followed by a number of case-histories of individual jobs tackled to date, and concluding with generalizations on job selection and development work undertaken. As this is probably the first time in history that a foundry has been specially built and equipped to operate such a wide range of precision-casting processes, it is particularly interesting to see which types of jobs are relegated to each section and to observe the trend of precision foundrywork towards general engineering work as distinct from aircraft applications.*

Site Development

The new Holbrook foundry of Samuel Osborn & Company, Limited, is the first development of a site of 75 acres which the firm has purchased at Eckington, about 7 miles from their main works in Sheffield. The buildings erected to date comprise two 200-ft. bays, each 50-ft. wide and a service annexe 28-ft. wide of the same length (see plan Fig. 1). It has been constructed specially to house the precision-casting activities of the firm—embracing shell-moulding and the CO_2 and Osborn/Shaw processes, integrated by common melting facilities, fettling shop, general office and technical services, heat-treatment and process control. Thus, one of the larger bays is devoted to melting and casting, together with the production of moulds and cores by the three processes, whilst fettling, heat-treatment and scrap-storage are confined to the second bay.

Special care has been taken in planning the scrap-storage area as the many grades of steel melted make the effective segregation of scrap essential. The annexe houses a sand-reclamation unit, pattern stores, pattern and plant maintenance shop, works office, shank-and-ladle preparation bay, laboratory, and a boiler house for space heating. This heating is provided by an oil-fired high-pressure water system, whilst forced draught ventilation gives ten air changes per hour. The proximity of the laboratory to the melting unit is noteworthy. The compressor house is at the furnace end of the foundry bay.

As the Holbrook works were built in a mining area and the ground is liable to subsidence, all foundations, footings and walls are reinforced. The roof of the building has a steel-framed structure and carries a monorail on the bottom tier; there is as yet no provision for an overhead crane. The floor of the building is comprised of 8-in. reinforced concrete with 1-in. granolithic surface. A separate calorifier has been installed for office heating and domestic hot-water supply, whilst under the administration block, there is a second low-pressure boiler for summer heating and hot-water supply. A busbar trunking system distributes electricity through the shop, and compressed air at 100 lb. per sq. in. is carried through a ring-main and is obtained from two 300 cub. ft. per min. compressors. Cooling water is provided from the main cooling system which is installed for furnace cooling as well as compressor cooling.

* Described in the JOURNAL, June 11, 1955.

Osborn's Facilities for Precision Casting

Dust extraction is provided for by two 300 cub ft. per min. fans. These are connected to independent sections of the dust-extraction system but are so arranged that one fan only can be used in the event of failure of the other. High efficiency cyclones are used for dust collection. The administrative block includes washrooms, canteen and locker rooms.

Flow-process Layout

The whole scheme of working at the Holbrook foundry has been conceived as essentially one of integrated flow-processes, see Figs. 2 and 3. Sand and other raw materials are received at one end of the foundry bay and after the necessary processing—drying, mixing, etc.—are distributed to the moulding and coremaking sections. After manufacture, moulds and cores are conveyed on racks to the closing section where they are assembled. After assembly, closed moulds are stored for short periods before casting. The storage facilities are so arranged as to be mobile, with the result that moulds requiring separate heats of metal or one particular alloy can be stored together. After the moulds have been placed on the casting floor, the transporting racks return to the mould-closing section automatically.

After pouring, the castings are transferred into pans which are taken to a roller-conveyor track on a special trolley which has roller track as a carrying platform. The roller track used for casting storage and the top of the trolley are at the same level. During the foregoing operations, there is a straight-line flow of production along the foundry bay, from sand-preparation to melting and casting. Castings are then transferred at right-angles into the fettling shop. After the heads have been removed, the castings pass through an initial shotblast in a barrel-type machine, this being operated by compressed air and is connected to the main extraction system for dust removal. Next, castings are loaded into smaller pans and proceed along one of the two main lines at right angles to which are arranged roller tracks to stations for either grinding or fettling.

At the end of the fettling line, those castings to be heat-treated are batched. After heat-treatment, the castings receive a final shotblast in a cabinet-type machine which has a built-in dust-separation unit of the filter type. This is operated by compressed air and uses a single nozzle which is manually controlled and arranged for manual loading and unloading. Before despatch, the castings are inspected and packed.

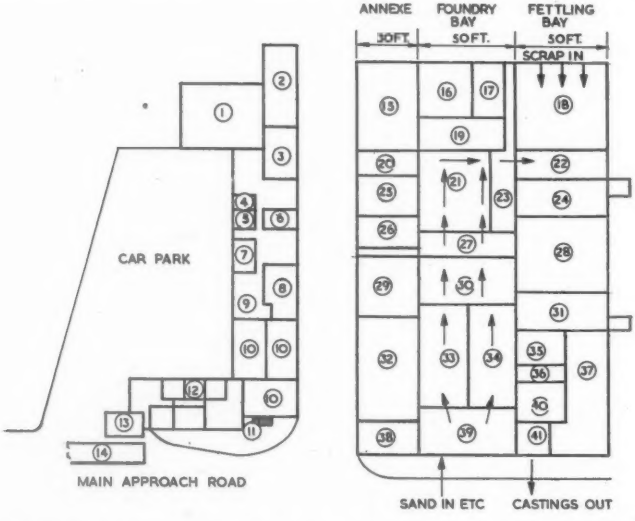


FIG. 1.—*Plan of the new Holbrook foundry of Samuel Osborn and Company, Limited.*

KEY: (1) Cloakroom, (2) substation, (3) W.C. (women), (4) switchroom, (5) mask washing, (6) time office, (7) first aid, (8) W.C. (men), (9) cloakroom, (10) locker and washrooms for men, (11) boiler house under, (12) admin. office, (13) weigh house, (14) road weigh-bridge, (15) boiler house, (16) compressor, (17) alloy store, (18) scrap store, (19) h.f. generator house, (20) shank preparation, (21) pouring, (22) cut-off, (23) cooling, inspection, sorting, (24) stores and shotblast, (25) lab, (26) office, (27) storage, (28) grinding, (29) plant and pattern maintenance, (30) closing, (31) fettling, (32) pattern store, (33) moulds, (34) cores, (35) inspection, (36) shot blast, (37) heat-treatment, (38) sand reclamation store, (39) sand preparation, (40) (41) dispatch.

Machinery and Plant

Melting

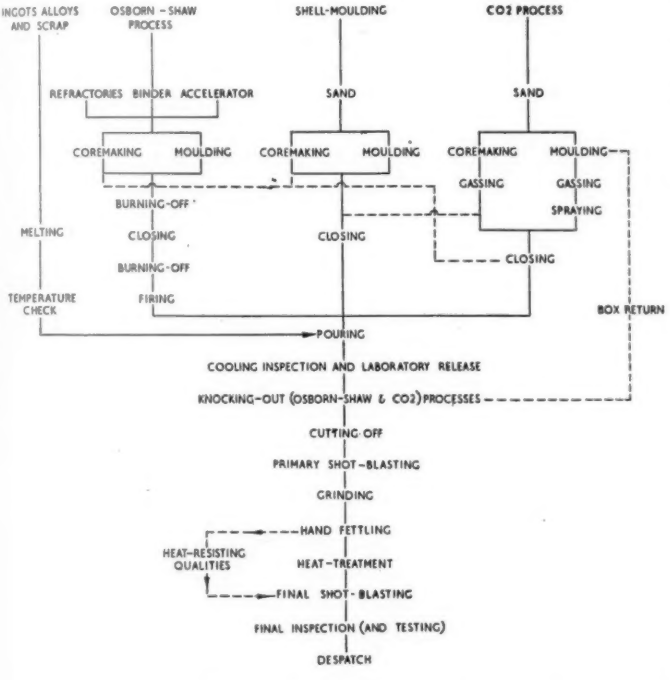
The Holbrook foundry has been so designed as to cater for a progressive increase in trade over a period of five years. This, of course, has entailed that the plant has been installed according to a definite schedule. The first stage was the installation of one high-frequency unit in July, 1957, and the second, early in 1958, to provide for a build-up in production from just below five to 10 tons of finished castings per week on single-shift working. The first melting unit consisted of one 1-cwt. body and one 5-cwt. body with a 200 kva generator. The second unit consisted of a 200 kva generator, but with two 5-cwt. bodies. At the present, melting capacity at the Holbrook foundry is provided by three 5-cwt. and one 1-cwt. high-frequency furnaces.

Moulding

Shell-moulding

Before listing the machinery and plant and describing its application in the Holbrook works, it is necessary to present an epitome of each process operated. As readers of this JOURNAL are

already aware, shell-moulds are thin casings or "biscuits" of fine silica sand bonded by phenolic resin. To make them, a dry mixture of sand and resin is dumped on to the heated surface of a metal patternplate, whereupon the thermo-setting properties of the resin result in the surface of the pattern retaining a coating of sand after excess is removed by inversion of the pattern. After baking in an oven, the then hard and rigid coating or "biscuit" is stripped from the pattern and forms a half-mould. It is then mated with a second half-mould similarly prepared and arranged for pouring in a manner not unlike ordinary moulds. Although the process is relatively new to the foundry industry, much specialized plant and equipment has been devised for applying it.



In the shell-moulding process, potential consistency in properties is essential and this can only be achieved if the sand and binder are properly mixed together in the correct proportion required by the exigencies of each casting. Hence, correct mixing equipment is essential as is the provision of accurate weighing facilities. In the Holbrook foundry, a mechanical mixer with a tumbling action has been found to be suitable for the mixing process, during which a small proportion of an anti-separation agent is added to ensure that the resin does not separate from the heavier sand. Ultimately it is intended to install mixers capable of producing resin-coated sands, and experiments are now being completed to ensure that the processes developed for this purpose will be effective. Using a powder mix, the sands used at present consist of proportions of Redhill "H" and "F," together with Chelford fine.

The moulding equipment at present available at the Holbrook works is as follows: (*a*) An electrically-heated twin-station machine which operates two 24-in. by 22-in. patternplates. This machine (supplied by the Polygram concern) is capable of producing shells from each station at a rate of 20 per hour, or 20 complete 24-in. by 22-in. moulds per hour. (*b*) Two smaller FLCB mould makers which each carry two patternplates 16-in. by 14-in. These machines are gas-heated and can be worked to achieve an average production rate of 20 complete full-sized moulds per hour from each machine. (*c*) A twin-station machine using a patternplate 24-in. by 16-in. and one gas-operated oven—the average production rate from the unit being 24 to 28 shells per hour. As the shells are produced, they are stored in mobile racks which transport the moulds to the closing and coring-up stations.

FIG. 2.—*Flow process chart of the working scheme at the Holbrook factory.*

CO_2 Process

In contra-distinction to shell-moulding, the CO_2 Process—also quite new—needs but little special equipment. It consists basically in the gassing of a specially prepared half core or mould part with CO_2 while it is still in the corebox or moulding box. The interaction of the CO_2 with a silicate binder in the special sand mixture causes it to harden and permit stripping, handling, and subsequent assembly for casting without the necessity for further drying or baking. Thus, the plant for the preparation of CO_2 moulds and cores at Osborn's Holbrook works consists of conventional bench-type coremaking and moulding, assisted by core-blowing and simple moulding machines (Fig. 3(*b*)).

Osborn/Shaw Process

The Osborn/Shaw Process is possibly the simplest of all three outlined when reduced to its bare essentials. Basically, it is an adaptation of the precision-investment casting process, but uses a non-expendable pattern, not a wax model (Fig. 3(*a*)).

FIG. 3.—*Views of various processes at the Holbrook foundry—(a) preparing Osborn/Shaw moulds; (b) mould making by CO_2 block process; (c) pouring shell moulds from a hand shank; (d) heat-treatment section.*

The first stage of production by this process is the manufacture of the master pattern, preferably made in brass, bronze, steel, or plaster. (Wood can often be used successfully but it must be remembered that the surface finish of the final casting can be of no greater accuracy than that of the pattern used.) In the Holbrook works, moulding has been developed as a bench moulding technique. The moulding material is poured by the operator in the form of a slurry over the pattern equipment, and the gelling reaction is so controlled that within a matter of a few seconds the slurry is changed to a tough rubbery gell which eventually solidifies. The mould is stripped from the pattern whilst it is still in this rubbery state, and this enables patterns to be used without any draw or taper and in some cases, with a slight undercut.

Immediately the moulds are removed from the

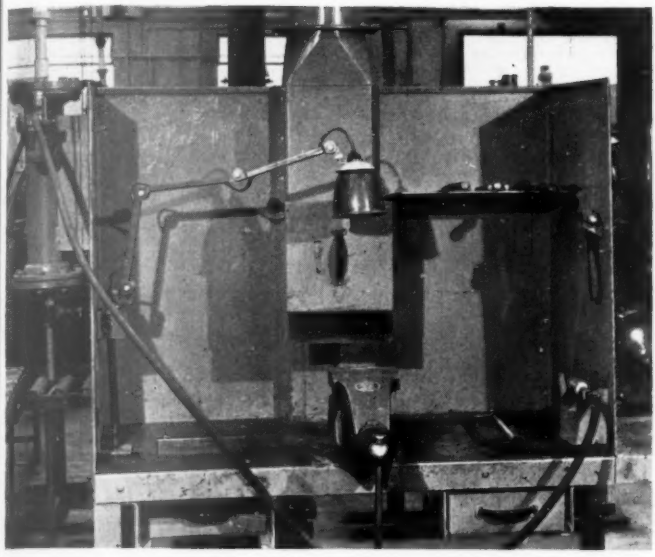


FIG. 4.—*Fettling bench designed for dealing with small precision steel castings.*

pattern, they are placed on a firing table near the moulding bench and ignited to ensure the rapid removal of surplus alcohol. After cooling, the moulds are transferred to a station where top- and bottom-part moulds are closed. Before pouring, the moulds are baked in a gas-fired furnace at 1,000 deg. C., to ensure that the refractory material is properly converted into a mullite.

Coremaking and Casting

Two shell coreblowers are installed at the Holbrook works, each capable of producing cores at a rate of 30 per hour. In addition, there are two manual core-filling stations which produce cores at the rate of 20 per hour per station.

In the casting area, the monorail located in the scrap area provides for the offloading and storing of incoming alloys and the handling of charges from the scrap stores to the furnace platform. An extension of the monorail runs in front of the furnace from the shank and ladle preparation area and over the pouring troughs—shanks and ladles being handled by hoists. During pouring, the ladles are carried by the monorail but are controlled manually for travel, rise, fall and tilt, the ladles are only lifted on and off the suspension equipment at the beginning and the end of pouring. The monorail is so designed to allow metal from any furnace to be poured on any one of the pouring troughs. In the production of very small castings, hand shanks are used in pouring.

Fettling

Four types of machines are used in the fettling shop to remove the heads, the machine used depending on the size and cross-section of the heads to be removed. Hence, heads of cross-section up to $\frac{1}{4}$-in. dia. are removed by a high-speed friction-type bandsaw (made by Midland Saw & Tool Company); slightly larger heads are removed by an abrasive cut-off machine with a rise-and-fall wheel. Another abrasive wheel cut-off machine used is of the radiac type. Very heavy heads are removed by torch and powder-burning units. A specially-designed fettling bench has been installed for dealing with small precision steel castings (Fig. 4). Castings are held in a vice and may be repositioned during the fettling process.

Here, also, pneumatic tools and hand tools are used so that a reasonable clearance behind the vice is essential. A fixed exhaust system is arranged and this proves to be satisfactory. Each fettling bench is a dual-station type with a small double-ended bench grinder mounted at one end, common to both operators.

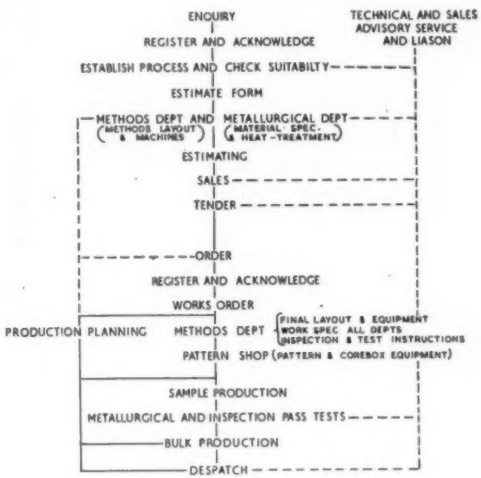


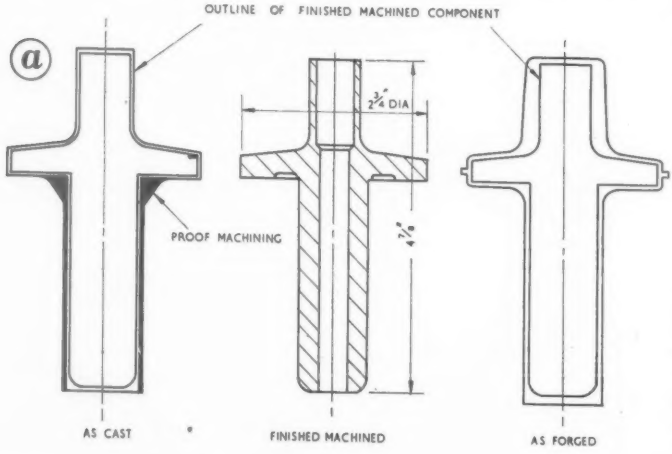
FIG. 5.—*Routing chart showing the various procedures between the time a job is estimated and the time of its dispatch.*

Hand tools are powered by compressed air, and rests are fitted for the pneumatic grinder, hammer and loose tools. In the top of the bench, there is a perforated plate which allows all sweepings off the

Osborn's Facilities for Precision Casting

bench to be collected in a removable drawer. Low-voltage light fittings are arranged over each fettling station and over the grinder, and a protective screen is fitted on three sides.

(*Continued on page 41*)



Example 1

MUSHROOM

The examples on this and on ensuing pages are actual case-histories of orders with which Samuel Osborn & Company have dealt at their new Holbrook factory. They will serve to illustrate more concisely than any other form of comment something of both the manufacturing procedure and the wide scope of the works. Example 1 shows details of the manner in which an order for "mushrooms" (used in the textile industry) was carried through. A comparison between the same part as-cast and as-forged can be seen at (a) *and* (b) *shows the patternplate itself as set out for shell-mould production. The mushroom before and after machining is shown at* (c). *Chart 1 is an almost exact reproduction of the sheet on which details of each order and remarks on the process to be used are entered once the order has been suitably "routed." In subsequent examples the charts are given in an abbreviated form, but no relevant information is omitted.*

CHART 1.

Description *Mushroom*	Reference No. *3C1*
Customer	Metal code *EW4/FC*
Trade *Textile*	Weight as cast *23.25 lb.*
Manufacturing process *Shell*	Weight finished *12.0 lb.*
	Yield per cent. *51.5*
Customer's Drg. No.	No. of castings per mould *6*
	Weight of one casting *2.0 lb.*

	C	Si	Mn	S	Cr.	Ni	Mo
Composition.. (per cent)	*0.10* *0.20*	*0.45* *0.75*	*0.50* *1.5*	*0.15* *max.*	*17.5* *18.5*	*10.0* *11.0*	*3.5* *4.0*

Composition remarks

Machining properties

Welding properties

Heat-treatment *Water quench 1,120 deg. C.*

Original method of manufacture. *Forging*

Advantages of casting *Reduction in machining with increased rate of production. Weight reduction from forging to casting*

Moulding machine *Polygram Mark 6e*	Pattern plate size *24 by 22 in.*
Weight of mould *14 lb.*	Weight of cores
Position for casting *Flat*	No. of cores per mould *None*
Remarks	Mould size *22 by 12 in.*
Pouring temp. *1,640 deg. C.*	

Proof machining carried out by *Samuel Osborn and Company, Limited*

Advice given to customer on tooling for machining

CHART 2

Description *Valve size 2½ in.* Trade *Valve* Manufacturing process *Shell*	Reference No. *2B3* Metal code *DN* Weight as cast *30.0 lb.* Weight finished *7.5 lb.* Yield per cent *25* No. of castings per mould *6* Weight of one casting *1.25 lb.*

	C	Si	Mn	S	P	Cr	Ni
Composition (per cent) ..	*0.12–0.18*	*0.50–max.*	*0.50–0.70*	*0.05–max.*	*0.05–max.*	*16.0–18.0*	*1.5–1.75*

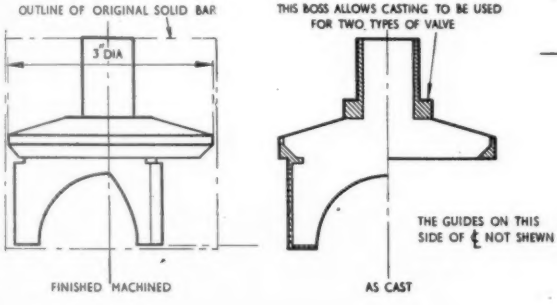
Heat-treatment *Air harden 950 deg. C. Temper 650 deg. C.*
Original method of manufacture *Machined from solid*
Advantages of casting *Reduction in machining with increased rate of production. Weight reduction from solid bar to casting*

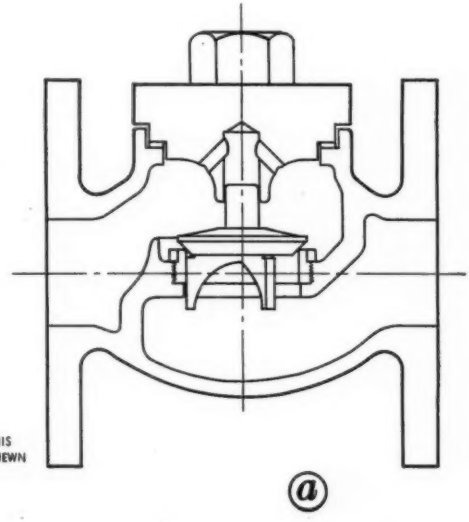
Moulding machine *Polygram Simplex* Weight of mould *8 lb.* Position for casting *Vertical* Pouring temp. *1,680 deg. C.*	Pattern plate size *16 by 14 in.* Weight of cores No. of cores per mould *None* Mould size *14 by 8 in.*

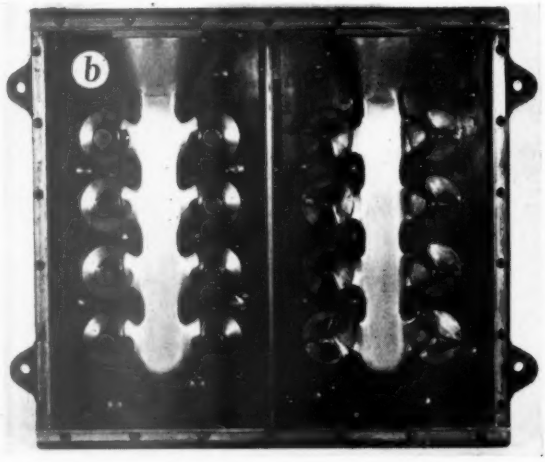
Example 2

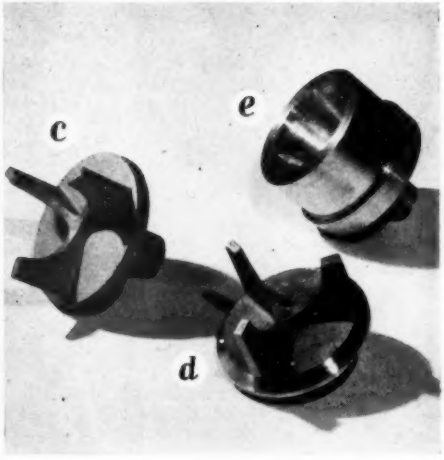
2½-IN. VALVE

In Example 2 details of a 2½-in. valve are shown, together with an assembly drawing showing the application. The manufacturing process utilized to fulfil the order was the shell-moulding process. As will be seen from the chart, the original method of manufacture was to machine from the solid. The advantages of the use of shell-moulding included a reduction in machining time and in consequence an increase in the rate of production. A weight reduction resulting from the new method is also noted. Illustration (b) *shows the shell-moulding pattern-plate,* (c) *the as-cast part,* (d) *the machined casting and* (e) *a stage in machining the component from solid bar.*


OUTLINE OF ORIGINAL SOLID BAR
3" DIA
THIS BOSS ALLOWS CASTING TO BE USED FOR TWO TYPES OF VALVE
THE GUIDES ON THIS SIDE OF ℄ NOT SHEWN
FINISHED MACHINED
AS CAST







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Example 3

THREE-WAY COCK BODY

The three-way cock body shown in Example 3 was made for the dairy industry and illustrates the way in which a casting can be completely re-designed to take better advantage of the shell-moulding process; at (a) *the design as originally submitted by the customer is contrasted to the modification finally agreed upon. The heavy connecting flanges were eventually produced separately and welded on and the body was re-designed so as to avoid steep changes in metal thickness. The patternplate and corebox can be seen at* (b), *the cock body as cast at* (c) *and after welding, machining and polishing at* (d).

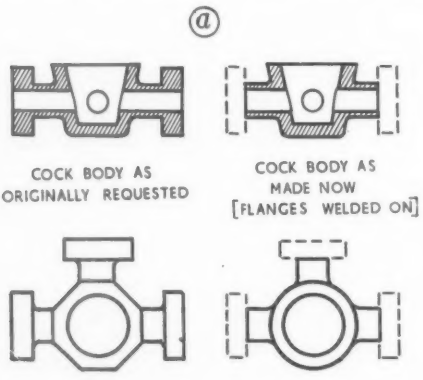


CHART 3

Description *3-way cock body size 1 in.*
Trade *Dairy*
Manufacturing process *Shell*

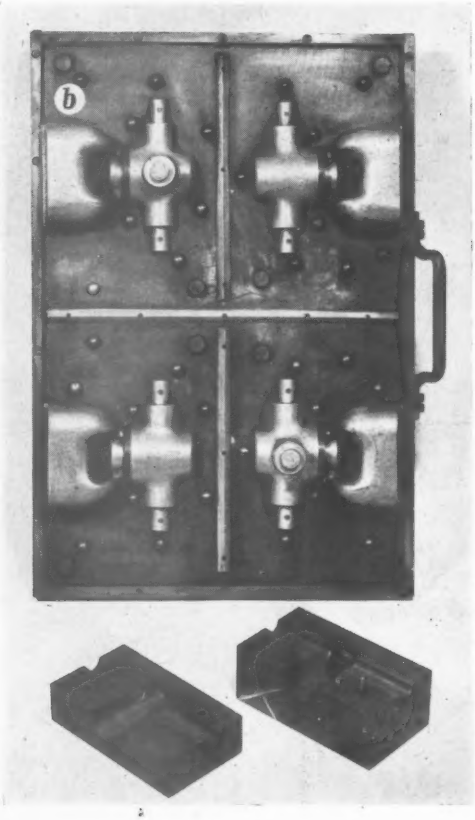
Reference No. *1D30*
Metal code *EW/CB/FC*
Weight as cast *15.75 lb.*
Weight finished *5.5 lb.*
Yield per cent *35*
No. of castings per mould *2*
Weight of one casting *2.75 lb.*

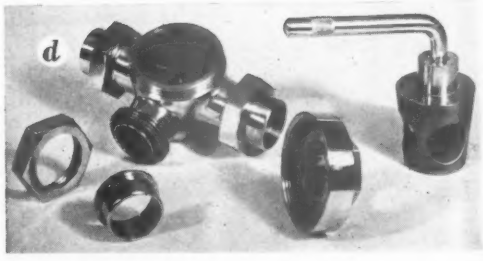
	C	Si	Mn	S	P	Cr	Ni	Mo	Cb
Composition (per cent)	*0.10–0.15*	*0.70–max.*	*1.5–max.*	*0.15–0.20*	*0.05–max.*	*18.0–20.0*	*10.0–11.0*	*3.0–3.5*	*10 x C%*

Heat-treatment *Water quench 1,120 deg. C.*
Original method of manufacture *Sand casting*
Advantages of casting *Redesigned for castability, with weight reduction and better appearance. Better finish for polishing. Sounder casting. Reduction in machining*

Moulding machine *FLCB*
Weight of mould *12 lb.*
Position for casting *Vertical*
Pouring temp. *1,620 deg. C.*

Pattern plate size *24 by 16 in.*
Weight of cores *1 lb. each*
No. of cores per mould *2*
Mould size *16 by 12 in.*

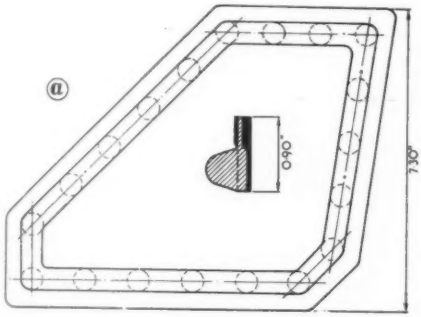


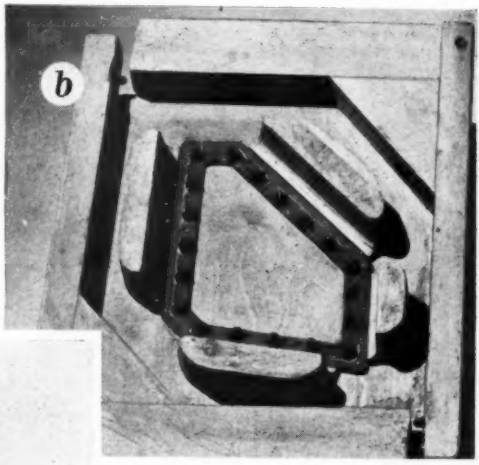


Example 4

ACCESS DOOR

Example 4(a) *shows details of a starboard access door produced by the Osborn/Shaw process for the aircraft industry. The pattern equipment appears at* (b) *and the finished product at* (c). *The original method of manufacture was to machine from plate. By casting an important reduction in machining was obtained, together with a decrease in weight from plate to casting and a very substantial saving in production man/hours.*





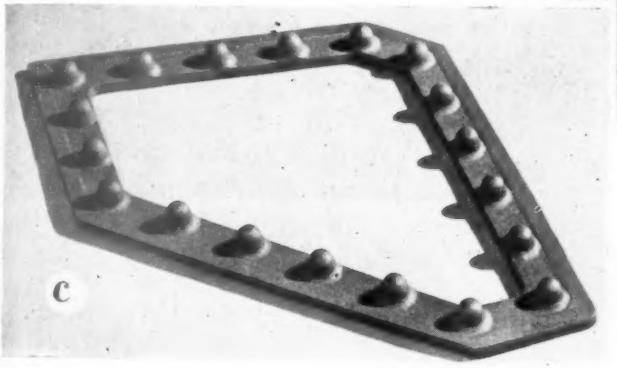


CHART 4

Description *Access door (starboard)*	Reference No. *IB6*
Trade *Aircraft*	Metal code *117*
Manufacturing Process *Osborn/Shaw*	Weight as cast *5lb.*
	Weight finished *1.25 lb.*
	Yield per cent. *25*
	No. of castings per mould *1*
	Weight of one casting *1.25 lb.*

Composition (per cent.)	C	Si	Mn	S	P	Cr	Ni	W
	0.23–max.	*0.70–1.3*	*1.3–max.*	*0.04–max.*	*0.04–max.*	*22.5–24.0*	*10.0–12.0*	*0.90 max.*

Heat-treatment *950 deg. C. (Water quench or air cool)*
Original method of manufacture *Machined from plate*
Advantages of casting *Reduction in machining. Weight reduction from plate to casting*

Moulding machine	Pattern plate size *Loose patterns*
Weight of mould *12 lb.*	Weight of cores
Position for casting *Flat*	No. of cores per mould *None*

Pouring temp. *168 deg. C.*
A.I.D. inspection

(*Continued from page* 38)

Heat-treatment

In a foundry making carbon and alloy steels, adequate provision of heat-treatment facilities is essential. At the Holbrook works, it was decided that the initial heat-treatment furnace capacity should be such that it could handle some 10 tons of finished castings per week, allowing for a 24-hour operation of the furnaces, where required. Future trends in production have not been overlooked and provision has been made for additional furnaces so that should the factory commence double-shift working, the heat-treatment department will be able to cope with the increased volume of castings.

There are five heat-treatment furnaces, each one being installed for a particular type of steel, *e.g.*, carbon steels, low-alloy steels requiring complex heat-treatment, low-alloy steels, and stainless and manganese-steels. Furnaces 1 and 2 are high-temperatures furnaces used for stainless and austenitic manganese steels which require air cooling or water quenching. A tank for water quenching is installed in front of the two furnaces and adequate provisions have been made for atmosphere control. The temperature range of the furnace is 650 to 1,150 deg. C.

Furnace No. 3 is used for annealing, normalizing and oil-quenching carbon and low-alloy steels and when required, handle martensitic stainless steels which require air- or oil-hardening. The oil-

Osborn's Facilities for Precision Casting

Example 5

FILLER MOUNTING PLATE

Example 5 shows another order for the aircraft industry—a filler mounting plate eventually "routed" for production by the Osborn/Shaw process. As in the case of example 4 this part was originally produced by machining from plate and by utilizing a precision-casting technique the amount of machining required was considerably reduced. Pattern tackle is shown at (b) *and the finished product at* (c).

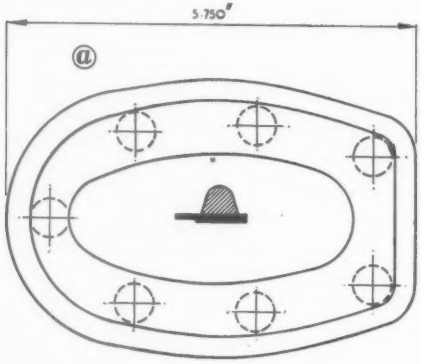


CHART 5.

Description *Filler mounting plate*	Reference No. *1B9*
Trade *Aircraft*	Metal code *117*
Manufacturing process *Osborn/Shaw*	Weight as cast *4.0 lb.*
	Weight finished *1.0 lb.*
	Yield per cent. *25*
	No. of castings per mould *1*
	Weight of one casting *1.0 lb.*

Composition (per cent)	C	Si	Mn	S	P	Cr	Ni	W
	0.23 max.	*0.70–1.3*	*1.3 max.*	*0.04 max.*	*0.04 max.*	*22.5–24.0*	*10.0–12.0*	*0.90 max.*

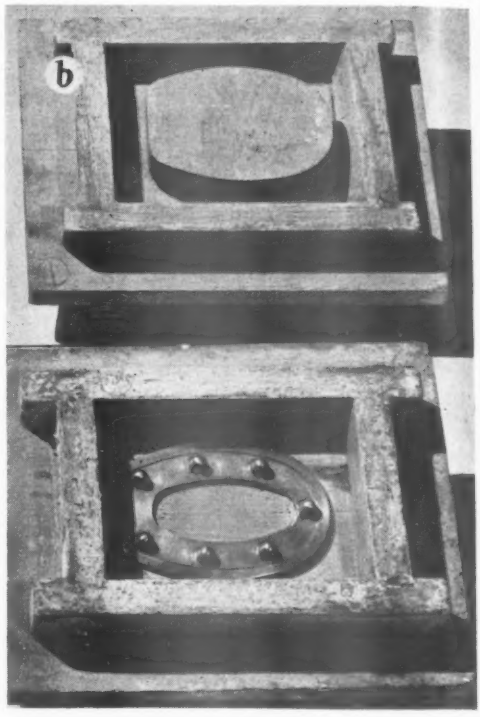
Heat-treatment *950 deg. C. (water quench or air cool)*
Original method of manufacture *Machined from plate*
Advantages of casting *Reduction in machining. Weight reduction from plate to casting*

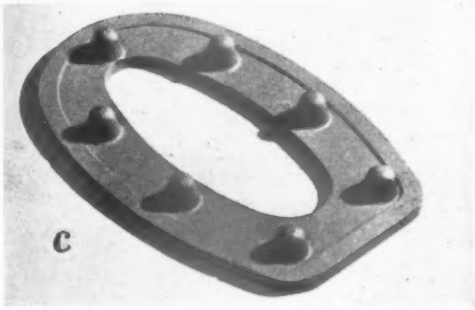
Moulding machine	Pattern plate size *Loose pattern*
Weight of mould *4 lb.*	Weight of cores
Position for casting *Flat*	No. of cores per mould *None*

Pouring temperature *1,680 deg. C.*
A.I.D. Inspection

quenching tank is situated in front of the furnace, the temperature range of the furnace being 650 to 1,000 deg. C. Atmosphere control is of paramount importance in this furnace to reduce scaling. Furnace No. 4 is a natural-draught, gas-heated, air-recirculating tempering furnace with a temperature range of 100 to 750 deg. C. Furnace No. 5 is a twin-pot type salt bath which is gas- and air-blast

(*Text continued on page* 44)





Example 6

ELBOW

Details of the production of an elbow (size 70 mm.) for the dairy industry are shown in example 6(a) *on page* 43. *The mould for a straight-end bend with one core in position for two elbows can be seen at* (b) *and at* (c) *the mould for a flared-end elbow is shown. Typical elbows, straight and flared-end, appear at* (d). *Chart* 6 *gives production details for a flared-end and chart* 7 *for a straight-end elbow of corresponding dimensions. Charts* 6-7 *give further information about manufacturing procedure.*

uring temperature 1,620 deg.

CHART 6

escription *Elbow size 70 mm.* (flared end)
rade *Dairy*
anufacturing process *Shell*

WST reference code No. *IN14*
Metal code *EW/CB/FC*
Weight as cast (+R & R) *40.0 lb.*
Weight finished (− R & R) *17.0 lb.*
Yield per cent *42.5*
No. of castings per mould *2*
Weight of one casting *8.5 lb.*

	C	Si	Mn	S	P	Cr	Ni	Mo	Cb
omposition (per cent)	*0.10–0.15*	*0.70–max.*	*1.5–max.*	*0.15–0.20*	*0.05–max.*	*18.0–20.0*	*10.0–11.0*	*3.0–3.5*	*10 × C*

eat-treatment *Water quench 1,100 deg. C.*
riginal method of manufacture *Sand casting*
dvantages of casting *Better finish for polishing. Sounder casting, considerable reduction in welding. Reduction in machining*

oulding machine *Polygram Mark 6e*
eight of mould *18 lb.*
osition for casting *Flat*
uring temperature at furnace *1,620 deg. C.*

Pattern plate size *24 by 22 in.*
Weight of cores *5 lb. 10 oz.*
No. of cores per mould *1 (2)*
Mould size *22 by 12 in.*

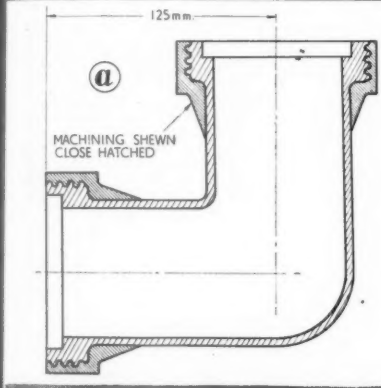


CHART 7 (other details as in chart 6.)

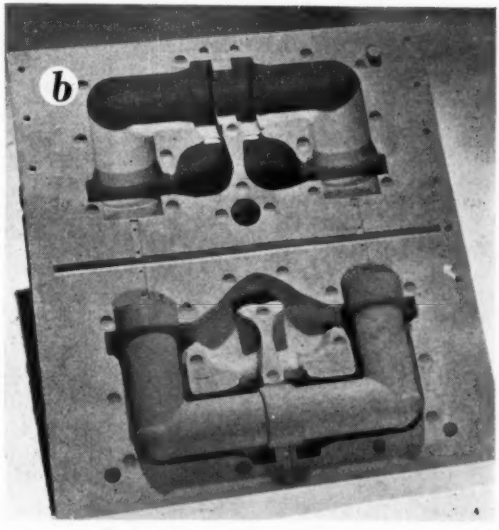
Description *Elbow size 70 mm.* (straight end)
Trade *Dairy*
Manufacturing process *Shell*

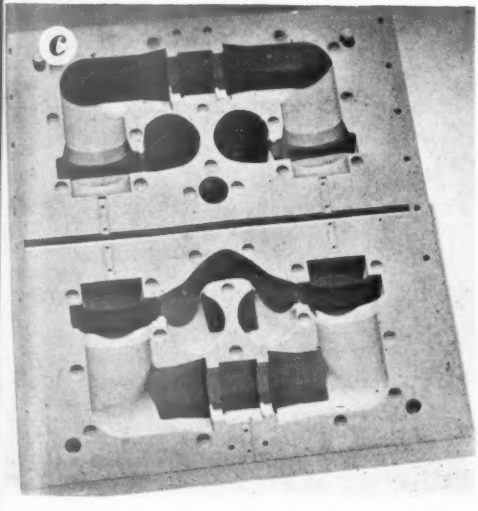
Reference No. *IN1S*
Metal code *EW/CB/FC*
Weight as cast *60.4 lb.*
Weight finished *24.5 lb.*
Yield per cent *40*
No. of castings per mould *2*
Weight of one casting *12.25 lb.*

Heat-treatment *Water quench 1,100 deg. C.*
Original method of manufacture *Sand casting*
Advantages of casting *Better finish for polishing. Sounder casting, considerable reduction in welding. Reduction in machining*

Moulding machine *Polygram Mark 6e*
Weight of mould *19 lb. 8oz*
Position for casting *Flat*

Pattern plate size *24 by 22 in.*
Weight of cores *5 lb. 10 oz.*
No. of cores per mould *1 (2)*
Mould size *22 by 12 in.*





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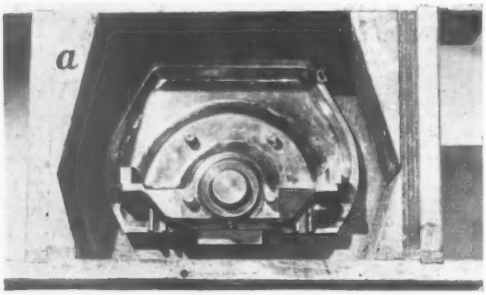


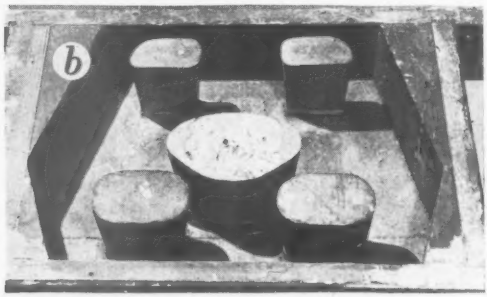


CHART 8

Description *Chamber end plate*	Reference No. *IH5*
Trade *Pharmaceutical machinery*	Metal code *BS/CB/FC*
Manufacturing process *Osborn/Shaw with oil sand core*	Weight as cast *102.5 lb.*
	Weight finished *41.0 lb.*
	Yield per cent *40*
	No. of castings per mould *1*
	Weight of one casting *41.0 lb.*

	C	Si	Mn	S	P	Cr	Ni	Mo	Cb
Composition (per cent)	*0.10–0.15*	*0.50–0.80*	*0.60–0.80*	*0.15–0.20*	*0.05–max.*	*18.0–19.5*	*8.5–9.5*	*0.15–0.20*	*10× C%*

Heat-treatment *Water quench 1,050 deg. C.*
Original method of manufacture *Fabricate or from solid*
Advantages of casting *Reduction in machining. Weight reduction as casting. Reduction in Cost.*

Moulding machine *o s*	Pattern plate size *Loose pattern*
Weight of mould *84 lb.*	Weight of cores *12 lb.*
Position for casting *Flat*	No. of cores per mould *6*

Pouring temperature *1,640 deg. C.*

heated. The pot size is 18 by 24-in. deep. This particular furnace is used for hardening where necessary to avoid loss of dimensions due to scaling. There is also a gas-heated degreaser unit of the standard cold line type which has a compartment size of 3 by 2 by 2-ft. deep.

Fixed tanks, suitable for accepting charges from two furnaces simultaneously, are used for the water-quenching system. This system has a circulating cooling system with a pump, air cooler and controlled water make-up. A circulating cooling system is also arranged for the oil-quench system. The quenching tanks, which have hinged lids, are situated below floor level. The lids are so designed to rest at 45 deg. to the horizontal and ensure that the operator is protected when raking castings into the quenching tank. These lids can be fully opened, however, to withdraw the quench basket. All the furnaces in the heat-treatment section are fitted with hinged chutes so that castings can be directed into baskets in the quenching tanks. These baskets are handled by chain blocks and the overhead monorail (mentioned earlier) and have drop sides for unloading.

After heat-treatment and before despatch, the castings are given a final shotblast in a cabinet-type machine (48-in. by 48-in. i.d.), which has a built-in dust-separation unit of the filter type. This is operated by compressed air using a single nozzle which is controlled manually and arranged for manual loading and unloading.

Example 7

CHAMBER END PLATE

The chamber end plate shown in example 7(c) *was manufactured by means of the Osborn/Shaw process (using an oil-sand core) for use in the field of pharmaceutical machinery. Normally such a component would be machined from solid; by precision casting the amount of machining required was greatly reduced. Parts of the pattern equipment used are shown at* (a) *and* (b).

Paper Work of Production Control

To give readers some idea of the paper work involved from the time a job is estimated to despatch (see Fig. 5), it is intended in what follows to enumerate step by step the various procedures:—Before an order is commenced, much estimating and costing work takes place, and a comprehensive estimate and cost sheet is first compiled. This includes, among many other details, the customer's reference, date received, description of casting, process to be used for manufacture, mould size, mould weight, grade of material to be used, number of cores per mould, number of runner cups per mould, number of castings per mould, pattern details and cost, detailed list of costs in connection with every stage of manufacture—from the cost of

Example 8

GEARBOX AND COVER

Example 8 shows other aircraft castings—a gearbox and cover produced by the Osborn/Shaw process. As in the previous example, the usual method of manufacture is to machine from solid and by the switch to precision casting the amount of machining required was substantially reduced. Part of the tackle for the gearbox can be seen at (a) *and* (b) *and the gearbox itself is shown at* (c) *with the cover at the top of the picture and a matchbox to the left to give some idea of the dimensions involved.*

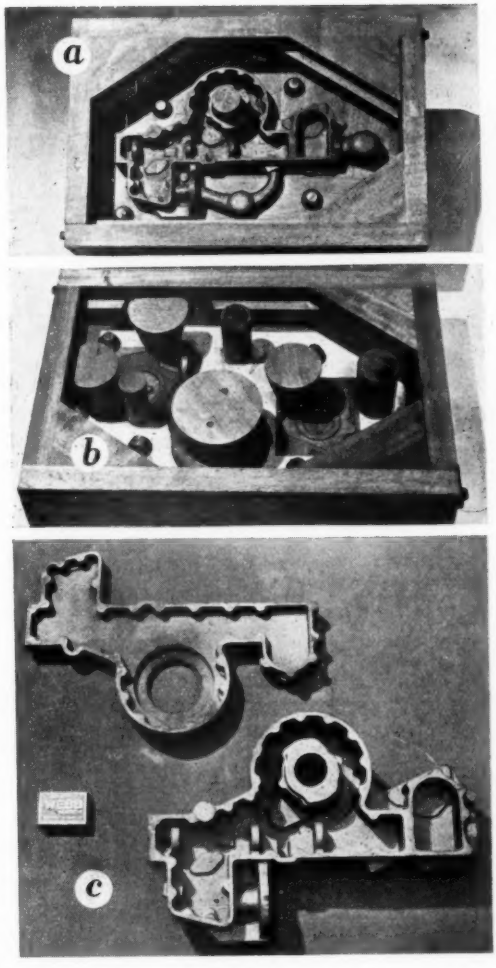


CHART 9

Description *Gearbox and cover*
Trade *Aircraft*
Manufacturing process *Osborn/Shaw*

Reference No. *3L35/36*
Metal code *BS/CB*
Weight as cast *59.0 lb.* and *23 2 lb.*
Weight finished *17.75 lb. and 7 lb.*
Yield per cent *30*
No. of castings per mould *1*
Weight of one casting *17.75 lb. and 7 lb.*

	C	Si	Mn	S	P	Cr	Ni	Mo	Cb
Composition (per cent)	0.10–0.15	0.50–0.80	0.60–0.90	0.05–max.	0.05–max.	18.0–19.5	8.5–9.5	—	10× C

Heat-treatment *Water quench 1,050 deg. C.*
Original method of manufacture *Machine from solid*
Advantages of casting *Reduction in machining. Weight reduction from solid to casting*

Moulding machine *O.S.*
Weight of mould *20 lb. and 15 lb.*
Position for casting *Flat*

Patternplate size *Loose pattern*
Weight of cores *2 lb.* (*box*)
No. of cores per mould *2* (*box*)

Pouring temperature *1,650 deg. C.*

the steel right through the production process to carriage and despatch. When this sheet is compiled and checked, a quotation is next supplied to the prospective customer.

Then after satisfactory agreement has been reached on price, delivery date, etc., a card index is made out for the customer. This gives full details of the customer, *viz.*, address or business, description of business, description of type of work available for the foundry, names and designations of company officials, with a record also of foundry or bilateral visits. The order from the customer is given a reference number which is quoted on all further correspondence and a letter is sent to the customer saying that order No. xx is being proceeded with and delivery is expected about..... An internal order (copy of which goes to the sales office) is made out and this states the quantity of castings required, customer's description, drawing number, grade of steel, manufacturing instructions, pattern availability and to what address the castings, when finished, are to be delivered.

A further record is completed for the customer and this is very comprehensive, including size of patternplate, pattern details, refractory, mould size and weight, investment, quantity of binder liquid These being merely a few of the details actually listed for the customer. When the first consignment of castings is ready for despatch, an advice note is sent by post to the customer and one is included with the castings. Finally, there follows the invoice which is sent on the day the castings are despatched.

General Comments

The accompanying case-histories will, it is hoped, have given a good idea of the present-day scope and potential of "precision casting" (used in a quite wide interpretation) as applied in the new Osborn foundry. They also contain indications of some, at least, of the lines along which its future development is likely to take place—that is, in simple engineering as distinct from purely aircraft applications—

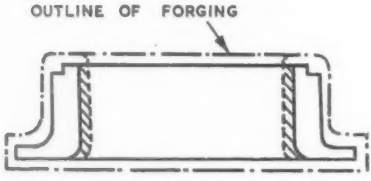
Osborn's Facilities for Precision Casting

Example 9

BUNG BUSH

The bung bush shown in Example 9 was made for the brewery industry and is an excellent practical demonstration of the degree of accuracy which can be obtained by the shell-moulding process. The finished article was specified to a tolerance across the diameter (see (a)) *of* +0.000 —0.004-*in. Tolerances of* +0.000—0.008-*in. however were found to meet the practical requirements of the customer; a "go and no-go" gauge kept the standard of inspection up to the level of actual needs. As will be observed from the drawing at* (a) *the component was normally manufactured by machining a forged part. Shell moulding reduced machining time and increased rate of production. The "biscuit" can be seen at* (b) *and at* (c) *the six castings from the one mould are shown, together with the final product in the form of an individual part (unmachined).*

BUNG BUSH AS CASTING
MACHINING SHOWN HATCHED



BUNG BUSH AS FORGING

FINISHED COMPONENT

CHART 10.

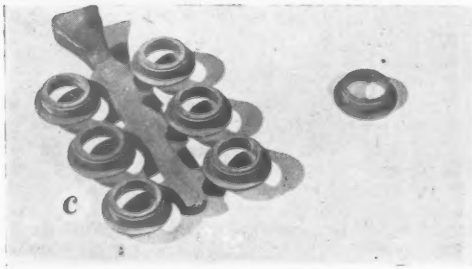
Description. *Bung bush size 3 in.*	Reference No. *1M1*
Trade *Brewery*	Metal code *BS/CB*
Manufacturing process *Shell*	Weight as cast *7.5 lb.*
	Weight finished *1.8 lb.*
	Yield per cent. *24*
	No. of castings per mould *6*
	Weight of one casting *0.3 lb.*

	C	Si	Mn	S	P	Cr	Ni	Cb
Composition (per cent.) ..	*0.10–0.15*	*0.50–0.80*	*0.60–0.90*	*0.05–max.*	*0.05–max.*	*18.0–19.5*	*8.5–9.5*	*10× C*

Heat-treatment *Water quench 1,050 deg. C.*
Original method of manufacture *Forging*
Advantages of casting *Reduction in machining with increased rate of production. Weight reduction from forging to casting*

Moulding machine *FLCB*	Patternplate size *24 by 16 in.*
Weight of mould *8 lb. 4 oz.*	Weight of cores
Position of casting *Vertical*	No. of cores per mould *None*
Remarks	Mould size *16 by 12 in.*

Pouring temp. *1,660 deg. C.*



in fact, in any application where *ultimate* economy can result for the customer as a result of using cast or cast/weld components. Although representative of what has been done to date, these examples should not be taken as being in any way inclusive or comprehensive since, with its wide range of facilities for precision casting, the company is ready to attempt and, in most cases, will be able to undertake, new work of many kinds in several specialized fields.

This alertness to fresh possibilities is an important factor in the company's development and in its current success in precision casting. Fundamentally, the achievement of the Holbrook foundry is that there, "under one roof," the most modern precision-casting facilities have been gathered together in order that the widest possible range of smaller close-tolerance work may be dealt with accurately and economically. With respect to the foundry trade as a whole, this means that new classes of business can be attracted.

Working on a "Provisional" Basis

Characteristic of the company's "developmental" attitude to new business is its avowed policy of

Example 10

EXTENSION UNIT AND FLANGE

Normally machined from solid, the extension unit and flange shown in Example 10 were made by the Osborn/Shaw process with a consequent reduction in machining and a weight reduction as from plate to casting. The casting (see drawing at (a)) was made one to the mould. ((c) shows pattern equipment—(1) and (2) for extension unit, (3) flange feeder.) The finished articles (d) had a weight of 1.75 lb. (extension unit) and 0.66 lb. (flange) respectively.

CHART 11

Description *Extension unit*
Trade *Aircraft*
Manufacturing Process *Osborn/Shaw*

Reference No. *1B11*
Metal code *BS/CB*
Weight as cast *7.0 lb.*
Weight finished *1.75 lb.*
Yield per cent. *25*
No. of castings per mould *1*
Weight of one casting *1.75 lb.*

	C	Si	Mn	S	P	Cr	Ni	Mo	Cb
Composition (per cent)	0.10–0.15	0.50–0.380	0.60–0.90	0.05–max.	0.05–max.	18.0–19.5	8.5–9.5	—	10 × C

Heat-treatment *Water quench 1,050 deg. C.*
Original method of manufacture *Machined from solid*
Advantages of casting *Reduction in machining. Weight reduction from solid to casting*

Moulding machine *0.8*
Weight of mould *6 lb*
Position for casting *Flat*
Pouring temp. *1,680 deg. C.*

Patternplate size *Loose pattern*
Weight of cores *1 lb.*
No. of cores per mould *1*

CHART 12.

Description *Flange*
Trade *Aircraft*
Manufacturing process *Osborn/Shaw*

Reference No. *1B10*
Metal code *BS/CB*
Weight as cast *2.64 lb.*
Weight finished *0.66 lb.*
Yield per cent. *25*
No. of castings per mould *1*
Weight of one casting *0.66 lb.*

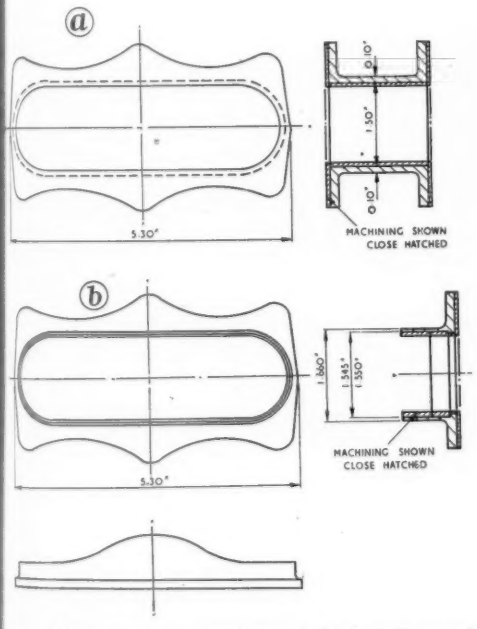
	C	Si	Mn	S	P	Cr	Ni	Cb
Composition (per cent)	0.10–0.15	0.50–0.80	0.60–0.90	0.05 max.	0.05 max.	18.0–19.5	8.5–9.5	10 × C

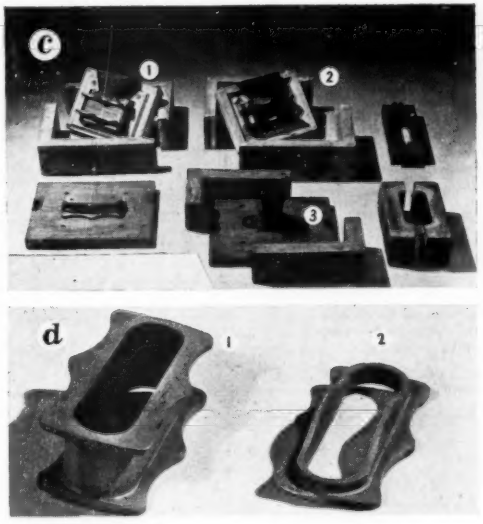
Heat-treatment *Water quench 1,050 deg. C.*
Original method of manufacture *Machined from solid*
Advantages of casting *Reduction in machining. Weight reduction from plate to casting*

Moulding machine
Weight of mould *4 lb.*
Position for casting *Flat*

Patternplate size *Loose pattern*
Weight of cores *1 lb.*
No. of cores per mould *1*

Pouring temp. *1,680 deg C.*
A.I.D. inspection





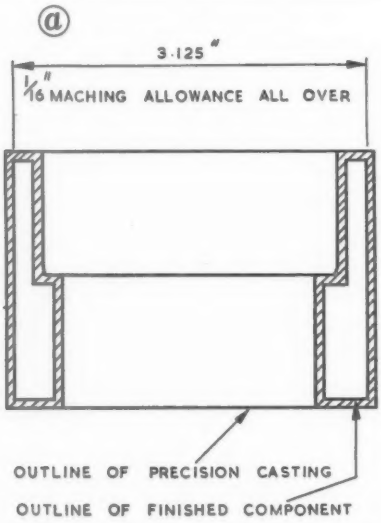
examining—on an experimental basis—all provisional orders, with a view to seeing if in fact these could be fulfilled economically by means of one or other (or combinations) of the three main processes employed. This exploration of possibilities, involving as it must discovery of what is *not* possible, can be a costly affair in terms of both time and money, but the view expressed is that even if it is found that a particular requirement cannot be fulfilled, or again, that a firm order cannot be obtained, a degree of real progress has been made—in knowledge and experience. In a venture

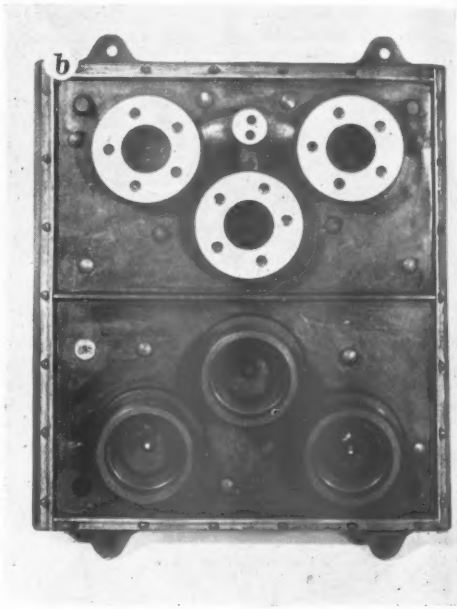
Osborn's Facilities for Precision Casting

Example 11

RETAINER SLEEVE

Example 11 *shows a retainer sleeve (used for engineering pump seals) made by the shell-moulding process. The size (see* (a)) *is* 2¼*-in. dia. and the weight of each individual casting is* 2 *lb. Three castings were made to the mould (shown in pattern equipment at* (b)). *Here again the usual method of manufacture is machining from bar and shell moulding offered definite advantages. The final article as-cast (left) and finished (right) appears at* (c).





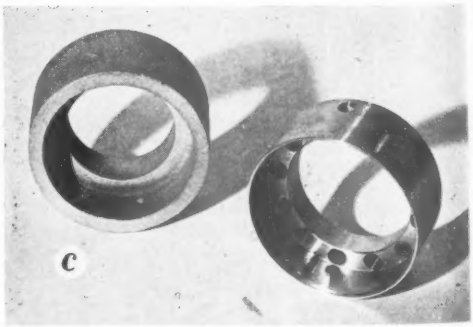


CHART 13

Description *Retainer sleeve size 2¼ in.*	Reference No. *2C10*
Trade *Engineering pump seals*	Metal code *EW/FC*
Manufacturing process *Shell*	Weight as cast *19.5 lb.*
	Weight finished *6.0 lb.*
	Yield per cent. *30.8*
	No. of castings per mould *3*
	Weight of one casting *2 lb.*

	C	Si	Mn	S	P	Cr	Ni	Mo
Composition (per cent)	*0 10–0 15*	*0 50–0 80*	*0 80–1.0*	*0.25*	—	*18.0–20.0*	*10 0–11.0*	*3.0–3.5*

Heat-treatment *Water quench 1,100 deg. C.*
Original method of manufacture *Machined from solid*
Advantages of casting *Reduction in machining with increased rate of production, weight reduction from solid bar to casting*

Moulding machine *Polygram Simplex*	Pattern Plate size *16 by 14 in.*
Weight of mould *8 lb. 5 oz.*	Weight of cores *2 oz. each*
Position for casting *Flat*	No. of cores per mould *3 (knock-off)*
Remarks	Mould size *14 by 8 in.*
Pouring temp. *1,660 deg. C.*	

such as that of Samuel Osborn this, if not immediately rewarding, is a real contribution to long-term development. As a concrete instance of the solid benefits which have accrued with experience, the fact may be mentioned that, since its initial work to fulfil orders for valve castings, the company can now anticipate—and with confidence—an important trade in that particular field.

Process Selection

A word about the relative spheres of usefulness of the three processes is appropriate here. Whilst there is a readiness to experiment with each method of production in the preliminary assessment of whether or not an order can be fulfilled, this must necessarily be modified by obvious considerations of cost. Thus, the Osborn/Shaw process must always

Example 12

SUMP MOUNTING PLATE

The sump mounting plate shown in Example 12 *was made for the aircraft industry by means of the Osborn/Shaw process. Normally the component is machined from bar. In this, as in other instances already cited, the switch to casting yielded a useful reduction in the amount of machining required and a reduction of weight as from solid to casting. The machining requirements can be seen at* (a)*; pattern equipment is shown at* (b) *and* (c) *shows the component as manufactured.*

CHART 14

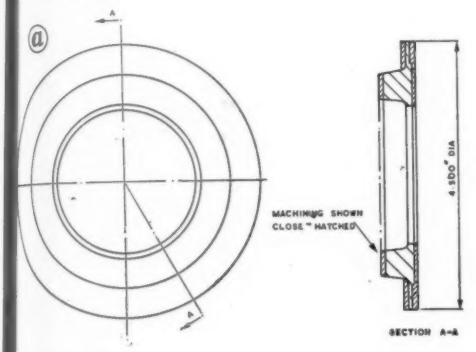
Description *Sump mounting plate*	Reference No. *1B4*
Trade *Aircraft*	Metal code *117*
Manufacturing process *Osborn/Shaw*	Weight as cast *4.0 lb.*
	Weight finished *1.0 lb.*
	Yield per cent. *25*
	No. of castings per mould *1*
	Weight of one casting *1.0 lb.*

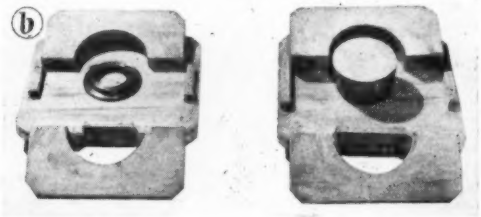
	C	Si	Mn	S	P	Cr	Ni	W
Composition (per cent.) ..	*0.23 max.*	*0.70–1.3*	*1.3 max.*	*0.04 max.*	*0.04 max.*	*22.5–24.0*	*10.0–12.0*	*0.90 max.*

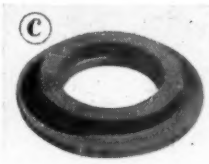
Heat-treatment *950 deg. C. (water quench or air cool)*
Original method of manufacture *Machined from bar*
Advantages of casting *Reduction in machining. Reduction in weight from solid to casting*

Moulding machine	Patternplate size *Loose pattern*
Weight of mould *5½ lb.*	Weight of cores
Position for casting *Flat*	No. of cores for mould *None*

Pouring temperature *1,680 deg C.*
A.I.D. inspected







Comparatively simple tackle, (*b*)*, comprising metal pattern, baseboard, frame and feeder-head, is needed to produce the casting shown at* (c) *by the Osborn/Shaw process.*

be intrinsically an expensive one, but the pattern equipment can be relatively cheap since wooden masters and plaster replicas can be used. However, when accuracy is of fundamental importance irrespective of the quantity ordered, metal patterns are used. The process is most useful when small quantities—even a few dozen—are required. Since materials are expensive, cost does not, as is the case with the shell-moulding process, decrease with the quantity made. However, the accuracy and surface quality of the castings are superior to that which can be achieved by the other processes presently employed at the Holbrook works.

Shell moulding has characteristics which are complementary to those typical of the Osborn/Shaw process. Pattern equipment for shell making is, of course, always made of metal and, in consequence, is expensive. This high initial cost usually rules out the use of the process for small quantities of castings. Nevertheless, there have been exceptional instances, particularly when shapes are complicated, when high pattern cost is justified for small numbers. On the other hand, the technique, once the pattern has been made, is not expensive and hence the larger the quantities cast, the lower the cost per individual casting. Its full value, therefore, is to be found when fulfilling large quantity orders.

How Much Accuracy and Where?

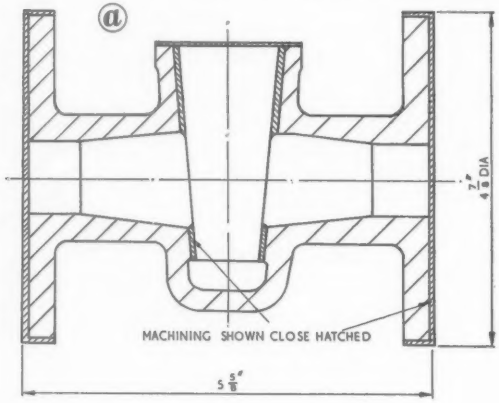
Then, at Osborn's, it is important to assess the relative importance of accuracy. All the processes employ a permanent pattern (as distinct from the lost-wax or Mercast processes of precision casting) and there must needs be quite early on when considering an inquiry an appreciation of what degree of accuracy in the finished casting is *really* necessary. Often, following a proper appraisal of just at which dimensions on a drawing close tolerance is essential, the moulding method can be so arranged as to keep those on one side of the parting line—a desirable attribute for all three processes operated.

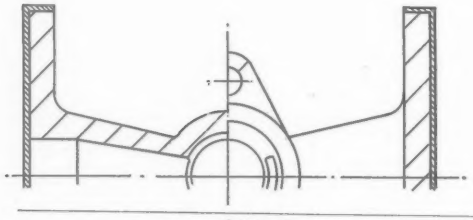
In the case of the third main process used at the Holbrook foundry—the CO_2 process—wooden patterns can be used, but metal patterns are to be preferred. This process finds its most useful field in the production of carbon or low-alloy castings required in smaller quantities and at moderate price. Here, both finish and accuracy attain a good standard, although naturally, not so high as is given by the Osborn/Shaw or the shell-moulding processes.

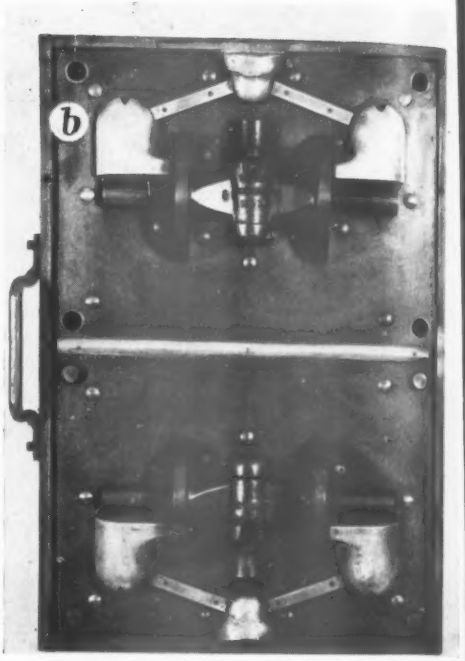
Example 13

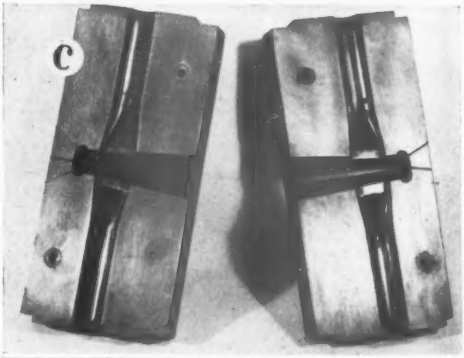
ONE-INCH VALVE BODY

Shell moulding was used for the one-inch valve body shown in Example 13. This component (weight 7.5 lb.) is usually manufactured by sand casting but the application of the newer method offered several advantages. By it a sounder casting was produced and weld repair almost eliminated. The amount of machining required was also considerably reduced as can be seen from the shaded sections of the drawing at (a). *The patternplate and corebox are shown at* (b) *and* (c) *and the finished valve at* (d).









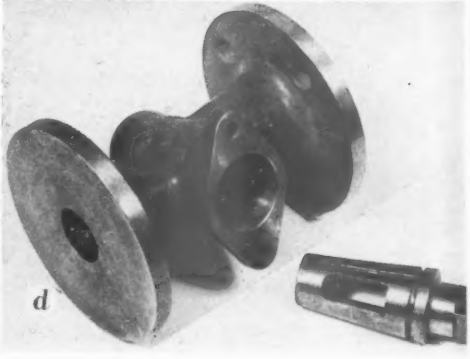


CHART 15

Description *Valve body size 1 in.*

Trade *Valve*
Manufacturing process *Shell*

Reference No. *1A2*
Metal code *BS/CB/FC*
Weight as cast *16.0 lb.*
Weight finished *7.5 lb.*
Yield per cent. *47*
No. of castings per mould *1*
Weight of one casting *7.5 lb.*

	C	Si	Mn	S	P	Cr	Ni	Mo	Cb
Composition (per cent)	*0.10–0.15*	*0.50–0.80*	*0.60–0.80*	*0.15–0.20*	*0.05–max.*	*18.0–19.5*	*8.5–9.5*	*0.15–0.20*	*10 × C*

Heat-treatment *Water quench 1,050 deg. C.*
Original method of manufacture *Sand casting*
Advantages of casting *Reduction in machining. Sounder casting, welding almost eliminated*

Moulding Machine *FLCB*
Weight of mould *13 lb.*
Position for casting *Vertical*
Pouring temp. *1,680 deg. C.*

Patternplate size *24 by 16 in.*
Weight of cores *10 oz.*
No. of cores per mould *1*
Mould size *14 by 8 in.*

Example 14

TWO VALVE BODIES

The valves shown in Example 14 *are of* 25.25 *lb.* (*drawing* (a)) *and* 15.5 *lb.* (*drawing* (b)) *respectively. Originally produced by sand casting* (*charts* 16 *and* 17 (*page* 52)) *they were "routed" at the Holbrook works for production by means of a* CO_2 *mould with a shell core. The final products are shown* (*page* 52) *at* (d) *where* (1) *and* (2) *show the heavier component in as-cast and finished states and* (3) *illustrates the* 15.5 *lb. valve in as-cast condition. The advantages of using* CO_2 *mould with shell core were that a sounder casting was produced, better finish obtained and machining cut down. The pattern equipment shown at* (c) *belongs to the* 25.25*-lb. valve body and in the upper part of the illustration the shell core can be seen. Below, on the other half of the pattern, the loose heads are shown. The pattern equipment for the smaller valve-body is not illustrated but it is designed on similar lines to that of the* 25.25*-lb. casting for* CO_2 *mould production. These are typical of a number of similar valves made at the Holbrook works.*

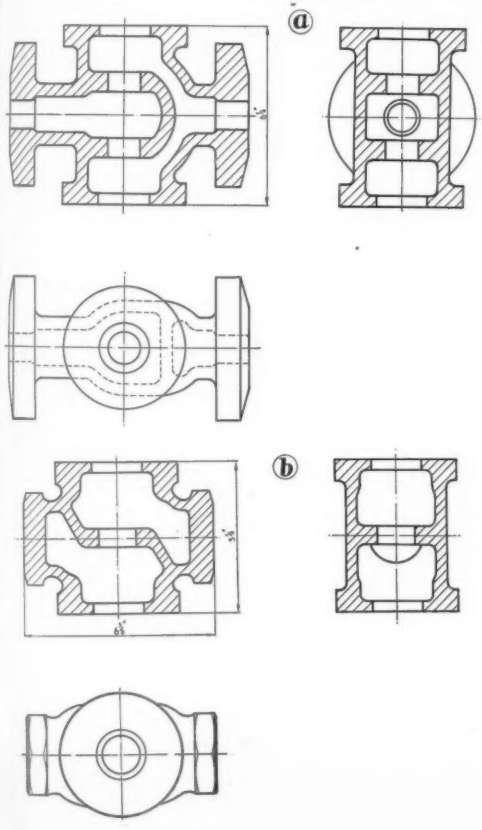


CHART 16

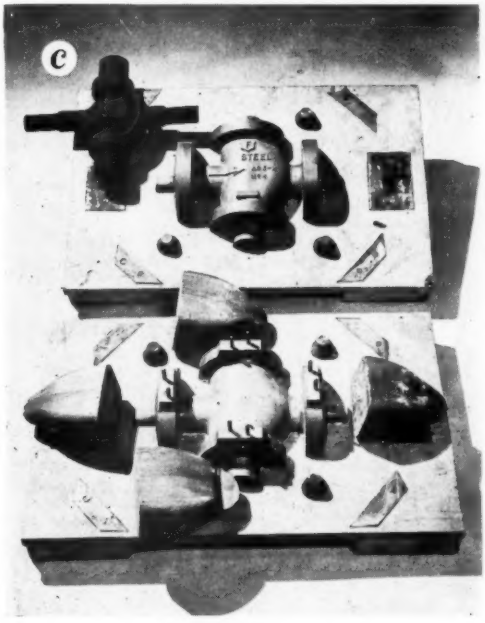
Description *Valve body*	Reference No. *2E7*
Trade *Valve*	Metal code *C 32*
Manufacturing process CO_2 *mould with shell core*	Weight as cast *58.25 lb.*
	Weight finished *25.25 lb.*
	Yield per cent *37*
	No. of castings per mould *1*
	Weight of one casting *25.25 lb*

	C	Si	Mn	S	P
Composition (per cent)	*0.25–0.30*	*0.50*	*0.60–0.70*	*-0.05 max.*	*-0.05 max.*

Heat-treatment *Normalize 920 deg. C.*
Original method of manufacture *Sand casting*
Advantages of casting *Better finish. Sounder casting, dimensional reductions for reduced machining*

Moulding machine *Plain jolt* (sand only)	Patternplate size *BEX 14 by 12 in. by 6 in. top, 4 in. bottom*
Weight of mould *45 lb. T.P. 34 lb. B.P.*	Weight of cores *1 lb. 14 oz.* (*shell*)
Position for casting *Flat*	No. of cores per mould *1*

Pouring temp. *1,640 deg. C.*



"The Best of All Worlds"

In order to obtain the best of each process, a degree of "overlapping" is often adopted, sometimes only after extended trials—as, for example, the use of shell cores in CO_2 moulds, CO_2 cores in shell moulds, and "Shaw" cores in shell moulds. The decision to use one or other of the three processes or one of the mixed methods described, is always subject to experience "in the field." It may happen, therefore, that an order which has

Osborn's Facilities for Precision Casting

been scheduled for fulfilment by one process is later switched over to another. Such "second thoughts" are due to a number of factors, amongst which are the characteristics of the metal being cast—as, for example, the metal/mould reaction of low-carbon steels in shell moulds.

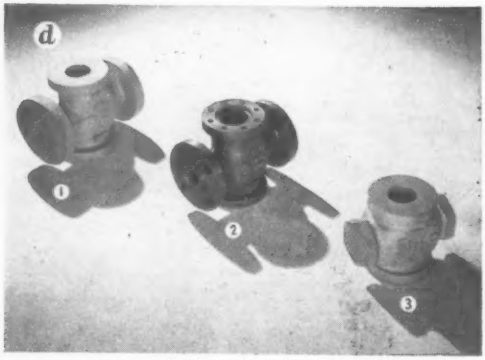


CHART 17 (SEE EXAMPLE 14).

Description *Valve body*	Reference No. *2E6*
Trade *Valve*	Metal code *C32*
Manufacturing process *CO_2 mould with shell core*	Weight as cast *54.5 lb.*
	Weight finished *15.5 lb.*
	Yield per cent. *28.5*
	No. of castings per mould *1*
	Weight of one casting *15.5 lb.*

	C	Si	Mn	S	P
Composition (per cent.) ..	*0.25–0.30*	*0.50–*	*0.60–0.70*	*0.05–max.*	*0.05–max.*

Heat-treatment *Normalize 920 deg. C.*
Original method of manufacture *Sand casting*
Advantages of casting *Better finish. Sounder casting Dimensional reductions for reduced machining.*

Moulding machine. *Plain jolt*	Patternplate size *Box 18 in 14 by 12 in. by 6 in. top, 4 in. bottom*
Weight of mould *48 lb. T.P. 36 lb. B.P.*	Weight of cores *1 lb. 6 oz. (Shell)*
Position for casting. *Flat*	No. of cores per mould *1*

Pouring temp. *1,640 deg. C.*

(To be continued)

Non-ferrous Club

A golf meeting, the second of its kind to be held by the Non-Ferrous Club, was organized on June 26, at Stratford-upon-Avon. In the morning a Stapleford Competition for the Metal Industry cup was played, the winner being Mr. H. B. Hoskison; in the afternoon there was a greensome when Mr. H. Bailey and Mr. E. Lisle were the winning pair. Dinner was taken at the Welcombe Hotel, Stratford-upon-Avon, and this was followed by the presentation of the prizes. Mr. H. McGhee, the chairman, then proposed that the first captain of the Non-Ferrous Club Golfing Society should be Mr. T. B. Taylor, and a further proposition created Mr. R. Deutsch the Society's secretary. For the July meeting, members of the Non-Ferrous Club met for luncheon at the Queen's Hotel, Birmingham on July 2, departing from usual procedure by having no guest speaker. Some 45 members and guests were present.

Sampling Dust and Fume

The British Iron and Steel Research Association, 11, Park Lane, London, W.1, has developed an apparatus for the sampling of dust and fume, which is equally serviceable for measuring fine or coarse dust emitted from crushing, grinding, sieving, or other industrial processes.

It uses as a base isokinetic sampling, by which care is taken that the gas in the sampling tube flows at the same rate as the gas to be sampled, as this yields true figures. The apparatus is described and illustrated in *Summary 115*, and it is commercially available from the Longworth Scientific Instrument Company, Limited, Thames Street, Abingdon, Bucks.

Steelworks Display at India House

To continue for a month, a window display at India House, Aldwych, London, which opened last week, depicts the part played by the Indian Steelworks Construction Company, Limited (a consortium of 13 companies) in India's second five-year plan.

The display includes a model of the new Durgapur steelworks, west Bengal, and exhibits from individual companies are shown in weekly rotation against a continuous background of ISCON and its activities.

Mr. W. H. Hindson, chief engineer of Iscon, showed colour-slides of films he had taken at Durgapur to employees of the Davy & United Engineering Company, Limited, Sheffield, in their canteen last week. Davy-United is responsible for £28,000,000 worth of the £100,000,000 contract.

Forty Years Ago

The July 1918 issue of the JOURNAL is particularly interesting even to-day, as it reported the annual conference of the Institute of British Foundrymen at which the first proposals for the formation of a research association for the foundry industry were made, and the promise of a medal, by Mr. Oliver Stubbs, for the best paper of the year was recorded. Mr. T. H. Firth, in his presidential address to the Institute, in an uncanny way forecast all the welfare conditions which exist to-day, *i.e.*, bathing and washing facilities, shorter hours, a guaranteed working week and a number of other factors which one takes for granted nowadays.

RUSTON-BUCYRUS, LIMITED, excavator manufacturers, of Lincoln, announces that it is now represented in south-west England by Mr. F. B. Lawrence, 38, Stoke Road, Taunton, and in South Wales by Mr. J. N. Revill, 31, Ashgrove, Whitchurch, Cardiff.

Casting a Bronze-age Axehead

One of the puzzles of archaeology is how a complicated alloy like bronze came to be used so early in the Bronze Age and replaced so quickly (for the manufacture of tools and arms at least) pure copper. The distribution of tin ore in the early world was much rarer than that of copper: in Spain, Cornwall and Saxony in Europe, in China and perhaps Malaya in the Far East. Yet there was only a short-lived "Copper Age" in Europe and in Egypt, and remarkably few pure-copper implements have been found. Where and how did this early knowledge of bronze occur? It might have been in China since in that country copper and tin ores are found in juxtaposition. It is known that the search for and trade in tin in the Bronze Age soon became of major importance, and it is not impossible that the early Arab seamen brought tin ore from Malaya to Egypt for the bronze foundries of that country. Later the Phoenicians fetched it from Cornwall to supply the craftsmen of the Mediterranean world.

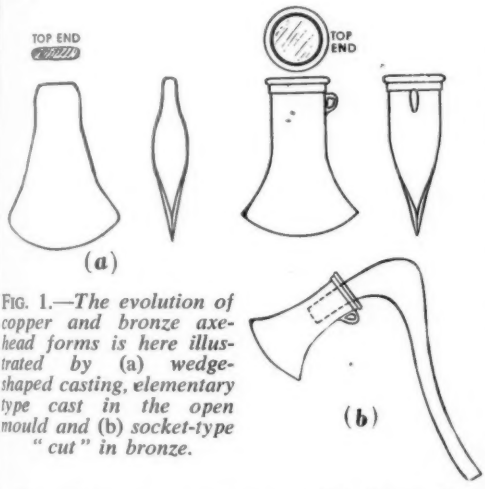


FIG. 1.—*The evolution of copper and bronze axehead forms is here illustrated by* (a) *wedge-shaped casting, elementary type cast in the open mould and* (b) *socket-type "cut" in bronze.*

The casting of pure copper is a difficult operation except in a mould open to the air. Thus the few castings of weapons were made simply in sand-impressions of an earlier stone implement. But it was found (and remarkably soon) that the addition of one part of tin to nine of copper produced the alloy, bronze—much harder and capable of giving, with hammering and grinding, a remarkably good edge—and that the molten mixture could be successfully cast in closed moulds making much more complex implements possible. Thus, there is evident in the transition from copper to bronze axeheads a steady progression of shapes evolving from the elementary wedge-shaped casting made in an open mould (Fig. 1 (*a*)) to the socket "cut" in bronze with a hole into which a bent handle of wood was inserted (*b*), this being tied on with thongs passing through the ring attachment.

SHORT TIME is being worked at the Round Oak Steel Works, Limited, Brierley Hill (Staffs), because of a shortage of orders for heavy structural steel, and about 100 unskilled workers have been made redundant.

Making Soft Iron Castings

The *Centre Technique des Industries de la Fonderie* report in a recent *Bulletin*, a case in which they were consulted by a Paris foundry which had to make castings of very low Brinell hardness (120 to 150). The report reads as follows:—

Manufacturing Conditions

The castings to be made were plates of diameters varying from six to nine feet and carrying on one face panelling of from 1 to 2-in. thick. For making these the cupola charge consisted of phosporic pig, returns from earlier casts, and mixed heavy scrap, together with silicon and manganese additions. The following percentage composition of the metal was quoted: C, 3 to 3.2; Si, 2.50 to 3; Mn, 0.50 to 0.60; S, 0.07 to 0.12, and P, 1.20 to 1.50. Melting was carried out in a 40-in. i.d. cupola, producing about four tons per hour. Brinell hardness tests carried out on the spirals of a casting produced under these conditions, showed figures ranging from 150 to 170. These were too high for the customer and it was necessary to produce castings of hardness within the limits quoted first.

Underlying Factors

Three elements which can have repercussions on the hardness of this type of casting are: chemical composition of the iron, the time between casting and stripping, and the casting temperature. A major effort towards improvement was directed towards the first point, as it was considered risky to vary the other two factors without too much disturbing manufacturing conditions. Tests were carried out on the effects of lowering the Mn and P content and increasing C and Si. The lowering of the Mn from 0.60/0.70 to 0.40 per cent. was without effect on the surface hardness, but on the other hand brought about the defect known as "inverse chill".

The quite substantial increase in the Si percentage of from 2.40 to 3.40 per cent. also had no effect on the hardness, but a lowering of the P content from 1.40 to 0.80 per cent. brought about an increase in the C content from 3.0 to 3.20 per cent. and the hardness was lowered to 146/150 Brinell.

This represented a considerable improvement, but the hardness was still at the upper limit of the range demanded, and so an effort was made to raise the carbon content somewhat by carrying out powder additions in the ladle. However, the efficiency of the operation was very poor and the increase in carbon obtained by this means was insignificant.

Use of Hematite

Finally, to obtain simultaneously high carbon-content and low phosphorus, use was made of a 100 per cent. hematite pig-iron charge. The composition of the iron was then C, 3.70; Si, 2.50 per cent., and the hardness of the castings ranged between 110 and 145 Brinell. Thus, by controlling the composition between the limits C, 3.60 to 3.80; Si, 2.40 to 2.70; Mn, 0.50 to 0.60, and P, 0.10 to 0.30 per cent., a result was obtained giving a sufficiently wide margin, permitting the casting of components of which the highest hardness lay well within the tolerances fixed.

22nd Building Trades Exhibition

The 22nd Building Trades Exhibition will be opened in the City Hall, Manchester on Tuesday, October 14, 1958, and will continue until Saturday, October 25. Over 65,000 sq. ft. of floor space will be occupied by exhibits in the three halls of the exhibition building, and a large portion of the balcony in the main hall has been allocated to display Apprentices' Competition entries, by arrangement with the Manchester, Salford and District Building Trades Employers' Association.

Courses for Teachers

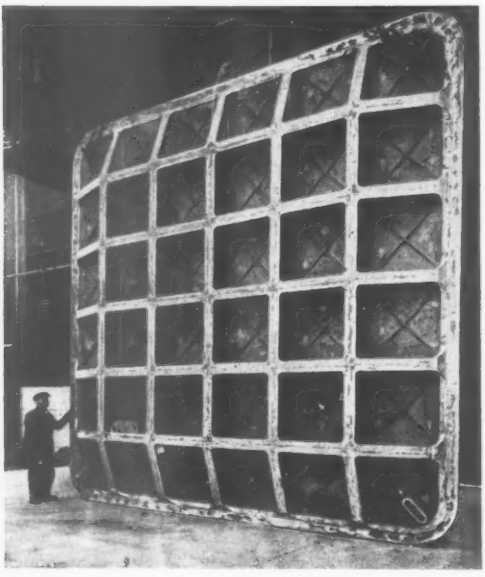
Teachers in technical colleges are to have new opportunities for full-time training while in service, it is announced in a memorandum which has been sent to local education authorities by the Minister of Education. There is a clear need, says the memorandum, to offer teachers, who have recently entered service, a period of full-time training in the principles and practice of teaching. For those who prefer to train before taking up appointments in technical colleges, improved training grants were announced recently.

The first courses will be held in the summer of 1959, at each of the three technical training colleges at Bolton, Huddersfield and London (Garnett College). Courses will last ten weeks and will cater for both day and resident students in engineering, building, commerce and other subjects. Technical college authorities are being asked to release staff on full salary. Tuition will be free; travelling expenses will also be payable.

It is also announced that as from September 1958, travelling expenses will be paid to school teachers who attend deferred courses of further training (supplementary and advanced courses). Assistance hitherto, has been limited to full salary and free tuition.

World's Largest Aluminium Casting?

The *Aluminium Courier*, which is published by the Aluminium Development Association, expresses the belief that the deep hatch cover, shown in the illustration below, is the largest aluminium casting yet made. It is 19-ft. 4-in. sq. and weighs 3½ tons. It was made by Lightalloys, Limited, of Alpax Works, St. Leonards Road, Willesden, and designed to meet the requirements of Lloyd's Register of Shipping. The aluminium-silicon alloy used—B.S. 1490:1955, LM6-M—has excellent casting characteristics, good ductility, adequate tensile strength and good resistance to corrosion.



British Coal Utilization Research Association

Annual Report 1957

The annual report for 1957 of the British Coal Utilization Research Association, has recently been published, and extracts from those sections having an interest for foundrymen are given below.

Among the research programmes that were substantially completed was that devoted to small-pipe, forced-circulation central heating. The development of this system, which offers many advantages over conventional central-heating systems, is the outcome of work in the Association's domestic appliance laboratories, and represents a major contribution of research towards the better use of solid fuel in the home. Exhibited on a number of occasions during the year, the small-pipe system has been given considerable Press publicity and has evoked wide public interest. More than 7,000 inquiries have been received at Leatherhead since the first information on small-pipe central heating was published.

Following the development by the BCURA of the freestanding convector fire with restricted throat, over 30 designs of this type of appliance are now on the market, and more manufacturers are planning production. Experience in a large block of flats has shown that such an appliance is able to overcome certain cases of chimney downdraught which occur with conventional open fires.

Clean Air Act

The implementation of the Clean Air Act will call for reliable means of assessing the amount of grit and dust emitted from chimneys. During 1957, the BCURA substantially completed its work on the formulation of procedures and on the design of equipment for measuring such emission. The experience gained is to be made available nationally through the publication of a handbook on the subject.

Gasification Research

The objective of the Association's gasification research, carried out under contract with the Ministry of Power, is to evolve efficient and reliable means for producing fuel or synthesis gas from low-rank coal in gasifiers operating at high pressures and at temperatures at which the ash is in the form of liquid slag. A slagging gasifier using 2,000 lb. fuel per hour has been erected, and studies of slag behaviour in it and on the laboratory scale are making good progress. This work is complementary to that being done by the Ministry of Power on part of the Association's site.

Copies of the annual report, price 10s., may be obtained from the Liaison and Publications Officer, BCURA, Randalls Road, Leatherhead, Surrey.

Industrial Injuries Fund

Although a total of £34,459,000 was paid out in benefits from the Industrial Injuries Fund in the financial year 1956-57—nearly £2,500,000 more than in the previous year—the balance in the fund at the end of March, 1957, was over £155,000,000, an increase of more than £16,000,000 in the year. The increase in benefit paid was due mainly to the growth in the number of disablement pensions, pensioners on October 31, 1956, numbering 142,100, almost 7,000 more than a year previously.

Pensions awarded because of pneumoconiosis rose by over 3,000 to 37,800 during the period, and other pensions also increased by about the same number.

South Wales Firm's Extension

On June 23, a new erection shop, being an extension to the old-established firm of Sheppard & Sons, Limited, Bridgend, Glamorgan, was officially opened by Major Cennydd G. Traherne, T.D., J.P., Her Majesty's Lieutenant in the County of Glamorgan. The erection shop (Fig. 1) is a high building, designed for later enlargement, and served by a 50-ton crane. The major item of equipment being erected was the shells for a pair of 40-ton Tagliaferri G.W.B. electric-arc furnaces for delivery to the Canadian Steel Wheel Company of Montreal. The works are well situated for the handling of this order as it is only a short haul to Cardiff docks, where a steamer will make a special call, as the whole consignment will weigh some 235 tons.

The company was founded in 1862, but since 1926, it has been wholly owned by the Hayes family. It operates a patternshop and an ironfoundry of approximately 9,000 sq. ft. and here, the whole of the production is made by the CO_2 method of moulding, resulting in economy of time and space, whilst surface finish has been improved. Castings up to 4 tons in weight are made for the firm's own shops and for customers.

The patternshop is well equipped and carries a good range of modern machines. A small amount of non-ferrous work is also undertaken. A running line for the foundry is the making of moulds or chills for the casting machines they make. Two machines have recently been delivered to Ford's for the Thames Foundry and one to John Cockerill of Seraing, Belgium. In the latter case, it is operating in conjunction with a Strico (Gummersbach, West Germany) hot-blast cupola. This contact is being widened by a fixed agreement between the two parties, whereby Strico will act as agents for Sheppard's, but the designs of the two plants will be integrated for economy in positioning. Already, a contract has been received from the Guss und Armurwerk Kaiserslautern, and it was officially handed over at the opening ceremony. Three more machines for the foundry industry were under construction.

There is a large fabricating shop with the usual equipment of cold section saws, guillotine shears, plate bending and presses and, of course, numerous welding installations. The machine shops are well equipped to handle large components for mining and general engineering industries.

The new erecting shop is 170-ft. long by 70-ft. wide, with a 30-ft. clearance to the crane hook. It is a major addition to the engineering facilities of South Wales, for the production of the heavier type of industrial plant.

FIG. 1.—*General view of the new erecting and fabricating shop at Sheppard & Sons, Limited, Bridgend.*

Variable Steel Production

Steel and pig-iron production in May dropped by 7.0 and 2.8 per cent., respectively, compared with the April figures. This could have been forecast with fair accuracy owing to the incidence of the Whitsun holiday and the gradual reduction of producers' stocks. A similar decline in consumption of steel over the first quarter of the year, compared with the corresponding quarter of 1957, might have also been anticipated, but, in effect, the substantial rise in output by the motor-car industry was more than enough to offset declining steel consumption in other industries.

Lanarkshire Firm Changes Hands

The old-established Motherwell firm of Pott, Cassels & Williamson, manufacturers of certain types of sugar machinery, including centrifugals, is to be taken over by the Mirrlees Watson Company, Limited, Glasgow. With a view to maintaining continuity, the partners of Pott, Cassels & Williamson—Mr. J. H. H. Cassels, Mr. R. Williamson and Mr. I. H. C. Williamson—have agreed to join the board of the new company, which will be known as Pott, Cassels & Williamson, Limited, and will be operated as a subsidiary of the Mirrlees Watson Company, Limited.

News in Brief

THE NOTTINGHAM firm of railway engineers, Taylor Bros. (Sandiacre), Limited, is this year celebrating its centenary.

TALBOT STEAD TUBE COMPANY, LIMITED, will be exhibiting at the Farnborough Air Show this year on stand No. 241.

THE British Association for the Advancement of Science is to move on July 14 to the buildings of the Royal Society of Arts in Adam Street, Adelphi, London, W.C.2.

SIXTY-FOUR PER CENT. of the scientists and 66 per cent. of the engineers who graduated from Glasgow University last year left Scotland—14 per cent. more than in 1956.

IT IS REGRETTED that under "New Catalogues" published on page 787 of the June 26 issue of the JOURNAL, there was a misprint and the firm of R. J. Hunt was made to read R. J. Hart.

Two automatically controlled diesel generating plants are to be supplied to the Jamaica Telephone Company by Austinlite, Limited, a member of the J. Stone & Company (Holdings), Limited, group.

AS A RESULT of the lengthy strike at the Swindon works of the Pressed Steel Company, Limited, some of the malleable-iron castings manufacturers are short of work. One foundry last week laid off 50 of its men.

SOME 200 GUESTS attended a dinner at the Guildhall, Worcester, last week, to commemorate the centenary of the Providence Works now owned by the Metal Box Company, Limited. Sir Robert Barlow, the company chairman, presided.

ADA (HALIFAX), LIMITED, washing-machine manufacturers, have bought the Mile Cross Sheds, Halifax, formerly owned by Courtaulds, Limited, where they plan to develop a factory on full automation lines to produce 2,000 refrigerators a week.

WESSEX INDUSTRIES (POOLE), LIMITED, Dolphin Works, West Street, Poole, Dorset, have added to their line of manufactures a new 30-cwt. three-wheeled electric industrial truck. It has a 5-ft. by 3-ft. 6-in. platform and runs on pneumatic tyres.

A NEW RANGE of Chieftain 7-ton goods vehicles for home and export has been introduced by Albion Motors, Limited, of Scotstoun. There are four diesel-engined models in the range, each of which is marketed with left- or right-hand driving controls.

ENGLISH STEEL CORPORATION, LIMITED, Sheffield, received by road on Monday, July 7, a 40-ton transformer from the Loughborough works of the Brush Electrical Engineering Company, Limited. It is the first of two ordered by the Corporation for their River Don Works.

THE MORRISFLEX GROUP OF COMPANIES, under the leadership of the parent company, B. O. Morris, Limited, Briton Road, Coventry, have concluded an arrangement with the Wallace Corporation of America to manufacture, under licence, in this country, Wallace tube benders and abrasive cut-off machines.

FERGUSON BROTHERS, LIMITED, shipbuilders, Port Glasgow, have confirmed that they have received orders for two ships. One is a repeat of an order placed at the end of last year by the Government of Trinidad for a passenger-cargo vessel. The other is a tug for the B.P. Tanker Company for service in Iran.

A COURSE OF TEN LECTURES on "Refractories, their Manufacture, Properties and Applications," by Mr. L. R. Barrett, M.A., has been arranged by the Borough Polytechnic, Borough Road, London, S.E.1. The lectures are to be held on Friday evenings at 7 p.m., starting on October 10. The fee for the course is 20s.

THIRTY APPRENTICES of the British Motor Corporation left Longbridge, on July 5, for an instructional tour of factories in Belgium, Germany and Holland. In Belgium the apprentices will visit the World Fair and then go on to Germany for a visit to the Auto Union Works at Düsseldorf. The party will return to Birmingham on July 20.

THE EIGHTH NATIONAL CONGRESS of the *Associazione Italiana di Metallurgia* (Via Moscova 16, Milan, Italy), is to be held from September 21 to 24, in the headquarters of the Politecnico of Turin, Corso Duca Abruzzi 24. The works visits, which are extremely attractive, are to be made to Fiat; Cogne (Aosta) and Olivetti (Ivrea). Details are available from the secretary of the Association at the above address.

TO MARK their appointment as the United Kingdom distributors of electronic equipment for industry, made by Beckman Berkeley & Berkeley Helipot, Richmond, California, U.S.A., a series of demonstrations for directors, scientists, engineers and chief executives will be held at the works of Winston Electronics, Limited, Shepperton, Middlesex, each day, from July 15 to 18 inclusive, commencing at 9.45 a.m. British, American and German engineers will explain and demonstrate the equipment.

SOME HISTORIC PRODUCTS of the automobile industry are to be transferred from the Rootes Group factory at Coventry, to be put on permanent exhibition at the Montagu Motor Museum at Beaulieu in Hampshire. They include Segrave's 1,000 h.p. aero-engined Sunbeam which was the first car in the world to exceed 200 m.p.h. and also Segrave's 1924 *Grand Prix* Sunbeam. Lord Montagu in co-operation with the Rootes company has arranged the transfer so that the vehicles can be on display to a wider public.

THREE MEN with a total service of 144 years retired last month from the Davy and United Engineering Company, Limited, Sheffield. Mr. Harry Dyson, despatch clerk in the traffic department, joined the firm in 1900; Mr. Thomas Warren, installation engineer, had been with them since 1905, apart from a five-year term when he served with one of the firm's customers; and Mr. Walter Newburn, specialist in heavy-engineering machine-shop and production practice, had served for 38 years, with a break of five years.

RICHARD FIRTH & SONS, LIMITED, textile-machinery makers, Brook Mills, Cleckheaton, have lost their appeal against the decision of Spenborough Borough Council not to approve of their use of the former Methodist Central Chapel, Cleckheaton, for storage and office purposes. The report of the Ministry inspector states that the use of the chapel as a respository for textile-machinery, especially in view of the industrial element involved, was unacceptable. The Minister of Housing and Local Government said it would be reasonable for purely storage use, but the use of a lathe was involved.

BY ARRANGEMENT with the Government a large factory is to be built for the Pressed Steel Company, Limited, in Swansea. It will be one of the most modern of its kind in the world and will embody a high degree of automation. It is expected that 2,000 will be employed within 18 months of occupation and that the labour force will increase to about 4,000 over the following four to five years. Completion is scheduled for the spring of 1960. The company plans to transfer by stages the whole of its Prestcold refrigeration division, which is at present divided between the Cowley and Theale factories.

Personal

Mr. JOHN C. MANTELL has been appointed assistant secretary of Birlec, Limited.

The Steel Company of Wales, Limited, announces that Dr. PETER RODERICK, has been appointed assistant chief metallurgist of the steel division of the company.

Mr. J. L. STURROCK, sales manager for the past six years of E. Boydell & Company, Limited, Manchester, has been appointed to the board of the directors of the company.

Mr. P. R. N. ULANDER has resigned his position as executive technical director of James Howden & Company, Limited, engineers, Glasgow. He remains on the board of the company.

Mr. EDGAR BROWN has retired from the boards of Guest, Keen & Nettlefolds (South Wales), Limited, and Nettlefold-Stenman Hinges, Limited, after 54 years with the Guest, Keen & Nettlefolds group.

Mr. L. A. McGEOCH, chairman and managing director of William McGeoch & Company, Limited, brassfounders, of Glasgow and Birmingham, and Mrs. McGeoch have celebrated their diamond wedding anniversary.

Presentations on behalf of the directors, staff, and workmen of Colvilles, Limited, the Scottish steelmakers, have been made to Dr. JOHN M. FERGUSON, works manager, who has retired after 50 years' service with the company.

The EARL OF HALSBURY has accepted an invitation to remain in office as president of the Institution of Production Engineers for a further year, 1958-59. Mr. H. W. BOWEN has been elected chairman of council and Mr. R. H. S. TURNER, vice-chairman.

Dr. E. O. HALL, a lecturer in physics at Sheffield University, has been appointed Associate Professor of Metallurgy at Newcastle University College, New South Wales, Australia. He has been engaged in research work into metal physics-magnetism and the structure of metals and alloys.

Mr. GEORGE BUTLER, who started work with the Butler Machine Tool Company, Limited, Halifax, as an apprentice, has been appointed recently to the board of directors. In January, 1957, he was appointed chief designer of the firm. (Mr. Butler is not a member of the Butler family, the owners of the firm.)

At a recent meeting of the directors of Close Tolerance Castings, Limited, and the parent company, Clino Foundry Supplies, Limited, Mr. T. R. A. WATERHOUSE was appointed managing director of Close Tolerance Castings, Limited, still retaining his working directorship with Clino Foundry Supplies, the new appointment taking effect from July 1.

Presentations on behalf of officials and staff have been made to Mr. R. BROOKE DORMAN, of the engineering staff of the Redcar Works of Dorman, Long & Company, Limited, to mark his retirement. Mr. Brooke Dorman, a nephew of the late Sir Arthur Dorman, founder of the Dorman, Long group of companies, was concerned in the building of the Redcar Works.

Vickers, Limited, announces that because of continued ill-health, Mr. ERIC JAMES WADDINGTON has been granted sick leave until December 31, when, on reaching normal retirement age, he will retire as director of finance of Vickers and of Vickers-Armstrongs, Limited, and also from the boards of these two companies. While on sick leave Mr. Waddington's financial duties will be assumed by Mr. R. P. H. YAPP.

Mr. C. E. MILES, a director and manager of the Hampton boatyard of John I. Thornycroft & Company, Limited, has retired. He had been with the company since 1905. Two other members of the Hampton staff to retire are Mr. W. H. W. BRYANT, secretary (43 years' service), and Mr. H. C. BELL, assistant engineer manager (56 years' service). Mr. Miles is succeeded by Mr. H. BISH, Mr. Bryant by Mr. L. D. WEBSTER, and Mr. Bell by Mr. W. L. S. PRITCHETT.

Mr. JOHN BEECH who graduated at Sheffield University this year with first-class honours in metallurgy and won the Mappin medal and premium is to join the metallurgical research staff of the British Steel Castings Research Association in August. Mr. MICHAEL PALFREYMAN who is engaged in post-graduate research in the Department of Refractories Technology at Sheffield University, under a bursary provided by the BSCRA, has been awarded the Frank Holland Memorial Prize by the University.

Mr. ALEXANDER ROBERTSON assumed his duties last week as managing director of Glenfield & Kennedy, Limited, engineers, Kilmarnock, in succession to Mr. Henry Gardner. Mr. Robertson joined the staff of Glenfield's in 1946, and held a number of executive positions until 1953, when he was appointed managing director of the associated company of Alley & McLellan, Limited, Worcester. He is also a director of Glenfield & Kennedy Holdings, Limited, and remains on the board of Alley & McLellan, Limited.

Edgar Allen & Company, Limited, announce the appointment of Mr. W. H. EVERARD, manager of the electric-furnace, Tropenas and heat-treatment departments, as secretary of the Electric Steelmakers' Guild. The Guild, which was formed last year, aims to promote progress in the manufacture of steel for commercial purposes in electric melting furnaces, and to encourage exchange of information between members. Mr. Everard, the pioneer of the oxygen-lancing process in steelmaking in this country, was, in 1951, awarded the Williams prize by the Iron and Steel Institute.

Sir ANTHONY BOWLBY, Mr. WILLIAM W. FEA and Mr. WILLIAM A. NICOL have been appointed directors of Guest Keen and Nettlefolds, Limited. All have held senior appointments in the group for many years and are directors of a number of group companies. Mr. Fea has also been appointed chief accountant and Mr. Nicol has been appointed secretary of John Lysaght, a member of the group. Mr. EDWARD C. LYSAGHT, a director of Guest Keen & Nettlefolds, has been appointed chairman of John Lysaght. He succeeds Sir CHARLES BRUCE-GARDNER, who has retired from the board. The registered office of John Lysaght has been transferred to London Works, Smethwick, 40, Staffordshire.

Obituary

The death is announced of Mr. B. SUTHERLAND, chief metallurgist, Bonnington Castings, Limited, Edinburgh. Mr. Sutherland had been with the company since its inception in 1941.

Mr. LEONARD AUSTIN, who retired from the post of managing director of Wadkin, Limited, Leicester, on June 30, through ill-health, died on July 4 at the age of 70. He had been with the firm for 38 years, and was a director for 22 years.

Mr. JOHN ORR, who died recently at the age of 74, spent his working life in the service of Glenfield & Kennedy, Limited, engineers, Kilmarnock. He was foreman of the brass-finishing department when he retired at the age of 65, after 50 years' service.

Raw Material Markets

Iron and Steel

The blast furnaces are well provided with raw materials, the tonnages supplied being sufficient to cover consumption needs and to provide appreciable quantities for stock. Imports of iron ore continue to improve and for the five months to May shipments were about 400,000 tons up on the first five months of 1957. Arisings of ore from home sources are also maintained at good levels, the furnaces having substantial reserves of ore on hand. Blast-furnace coke is also being received in adequate quantities.

Because of the reduced demand for pig-iron, production at some units has been temporarily suspended, while at others outputs have been curtailed. Although steelworks continue to absorb impressive tonnages of basic pig-iron, their present usage continues to decline, due to the lessened demand for steel. In the high-phosphorus grades of foundry irons, also, production is much reduced, due to moderate demands. Only in the low-phosphorous irons is the demand remaining steady, although with increased production supplies exceed requirements.

Hematite and refined-iron makers could deal comfortably with a much larger inflow of orders. The foundries maintain their policy of keeping stocks at the minimum; there is little, if any, forward buying and, with the holiday season approaching, when deliveries will practically be entirely suspended, the furnaces will be compelled to place most of their outputs into stock. The engineering and speciality foundries are able to maintain a steady production of castings, and the motor vehicle trade continues to be the largest single user of high-duty castings.

Many of the machine-tool foundries are not obtaining the same output of castings as before, and the decline continues in demand from other users. The light-castings trade is quiet, and many of the jobbing and textile foundries are only moderately employed. All grades of pig-iron are available for the export market when orders can be obtained, but very low prices are being quoted by overseas makers and UK producers find it difficult to meet this competition. The foundries have plentiful supplies of scrap in all grades, and are well provided with foundry coke, ganister, limestone, and firebricks.

Most of the re-rollers continue to be moderately employed and there is no improvement in demand. Lack of orders compels most of them to work fewer shifts, difficulty being experienced in obtaining sufficient business for the guaranteed four working days; their rollings are obtained on a hand-to-mouth basis and they rely entirely on day-to-day arisings of orders. Stocks of billets are, therefore, being kept at the lowest levels. Home steelworks are able to deliver promptly the present call for steel semis, and could step up deliveries appreciably if there were additional demands.

Non-ferrous Metals

The automatic imposition of 1.7 cents a pound on copper imports into the United States on July 1 was interpreted bearishly in London, obviating as it does any opportunity to undersell US producers in their own markets. Accordingly, the London price has been sagging consistently. The persistent weakness was not all attributed to the levying of the import duty, however, as the settlement of the dispute at El Teniente was also a factor. Unfortunately, the UK Government's relaxation of the credit squeeze had no noticeable effect on non-ferrous metals.

In the United States the imposition of the copper duty had the direct effect of inducing the custom smelters to raise their price ½ cent to 26 cents a pound and prompted Phelps-Dodge to raise its price by 1½ cents to bring it into line with Anaconda at 26½ cents a pound. Kennecott is expected to follow suit. Consumer interest at the higher levels was none too brisk.

The acceptance of the proposal to stockpile 150,000 tons of copper now brings this issue straight before the full Senate and House of Representatives, where it is bound to meet with some opposition. One of the reasons why a smooth passage of the proposal is not expected is because the US Government is already absorbing some 10,000 tons of copper a month under the escalator clause in agreements made some years ago. The outlook is not clear. There are some bullish influences, but the fact that the holiday season has arrived presages a decline in consumer interest on both sides of the Atlantic.

Tin not only continues to weaken under the influence of Russian supplies to the market but also because of the sharp increase in offerings in Singapore, as July 1 was the start of the new quota period. The buffer stock manager, therefore, has been active again. But, even so, the forward price has dipped below the floor price for cash metal of £730 a ton. The outlook is not bright. Preliminary soundings of some members of the International Tin Council have apparently drawn dusty answers concerning the entry of Russia into the scheme. Meanwhile, substantial offerings from the Soviet Union are undermining the market and there is nothing in the way of evidence to refute the view that supplies will be maintained. The New York market is quiet and the price has dropped to around 94 cents a pound.

Lead is experiencing a bad patch and the former hard-earned gains in the price have now all been lost. Demand in London is only routine and the price is not far above £70 a ton. In the United States consumer interest continues weak, which has resulted in the quotation being lowered ½ cent to 11 cents a pound. The price decline was initiated by a leading custom smelter, as custom smelters do not stand to benefit very much from the present price support scheme; certainly not as much as they would under a stockpiling programme. Moreover, in so far as the price support scheme is concerned, new maximum subsidies payable by the Administration have been announced, and for lead it is now 3.9 cents a pound instead of 4 cents a pound. The price ceiling stipulated by the Administration on which the subsidy is payable remains at 15½ cents a pound. In Australia the Broken Hill lead smelter at Port Pirie is to reduce production by 15 per cent.

Zinc has shown some, but not a lot, of resistance to lower price levels. As in the case of lead the maximum subsidy has been lowered and for zinc it is now 2.9 cents a pound instead of 3 cents a pound. The ceiling price on which the subsidy is payable remains at 13½ cents, which compares with the current US price of 10 cents a pound. The zinc market has been helped by news of further cutbacks in production from Australia, where American Smelting & Refining is reducing zinc output a further 500 tons a month, and from the United States, where the American Zinc Corporation is closing down its plant at Tennessee for the first three weeks in July and Eagle Pitcher has suspended production from one of its plants indefinitely from July 3. These cutbacks will also help the statistical position for lead.

OWING to a falling-off in orders, Summerson's Foundries, Limited, Darlington, has introduced a four-day working week. The firm states that while it is receiving a fair share of the work available, it was not enough to justify a five-day week.

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

July 9, 1958

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £47 0s. 0d. to £47 10s. 0d., scale 17s. 0d. per unit; 75 per cent. Si, £66 0s. 0d. to £66 10s. 0d., scale 17s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 6d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 6s. 9d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 9s. 9d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £91 10s. 0d., basis 60 per cent. Cr, scale 30s. 0d. to 30s. 6d., per unit; over 6 per cent. C, £87 10s. 0d., basis 60 per cent. Cr, scale 30s. 6d. per unit; 2 per cent. C,* 2s. 0d. per lb. Cr; 1 per cent. C,* 2s. 0½d. per lb. Cr; 0.15 per cent. C,* 2s. 1½d. per lb. Cr; 0.10 per cent. C,* 2s. 1¾d. per lb. Cr; 0.06 per cent. C,* 2s. 2d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £265 0s. 0d.; 96/98 per cent., £295 0s. 0d.

Ferro-columbium.—65/72 per cent., Nb + Ta, 19s. 9d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £83 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t. £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s., 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats, 5 in. wide and under, untested soft basic, 50 tons and over: £40 0s. 6d; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g. £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s 6d. galvanized corrugated sheets, 24g., £66 16s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £196 10s. 0d. to £197 0s. 0d.; three months, £197 0s. 0d. to £197 10s. 0d.; settlement, £197 0s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 1s. 10½d. per lb.; rods, 218s. 9d. per cwt. basis; 20 s.w.g., 252s. 0d. per cwt.

Tin.—Cash, £730 0s. 0d. to £731 0s. 0d.; three months, £731 0s. 0d. to £731 10s. 0d.; settlement, £731 0s. 0d.

Lead (Refined Pig).—First half July, £71 15s. 0d. to £72 0s. 0d.; first half October, £73 10s. 0d. to £73 12s. 6d.

Zinc.—First half July, £63 10s. 0d. to £63 15s. 0d.; first half October, £64 0s. 0d. to £64 5s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £96 17s. 6d.; rolled zinc (boiler plates), all English destinations, £94 12s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £87 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 6½d. per lb.; sheets to 10 w.g., 165s. 0d. per cwt.; wire, 2s. 4d.; rolled metal, 165s. 0d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £135; B6 (85/15), £175; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £175; HTB2 (38 tons), — ; HTB3 (48 tons), £191.

Gunmetal.—BS1400, LG2 (85/5/5/5), £164; LG3 (86/7/5/2), £174; G1 (88/10/2/½), £236; (88/10/2/1), £233.

Phosphor Bronze.—BS1400, PB1 (A1D released), £249 per ton.

Phosphor Bronze Strip, etc.—Strip, 244s. 0d. per cwt.; wire, 3s. 7¾d. per lb.; rods, 2s. 10¾d.; tubes, 2s. 10¾d.; chill cast bars: solids 2s. 10¾d.; cored 2s. 11¾d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 6½d. per lb.; round wire, 10g. in coils (10 per cent.), 3s. 11d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 3s. 10d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £76 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £190 0s. 0d.; aluminium bronze (BS1400), AB1, £201; AB2, £214.

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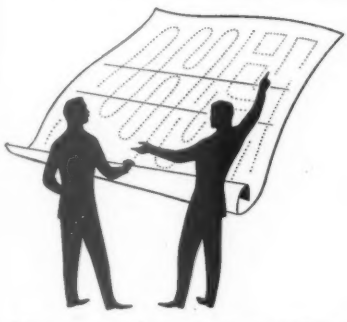

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Company News

MIDLAND ALUMINIUM, LIMITED—The directors deny rumours that a bid for the company's shares has been made. They add that there are no negotiations in course or envisaged.

MIRRLEES WATSON COMPANY, LIMITED, engineers and ironfounders, of Glasgow—Mr. D. M. Semple, chairman, states that the year ended with a greater value of orders on hand than a year before.

PARNALL (YATE), LIMITED, domestic, electrical and mechanical engineers, of Yate, Bristol—The offer by Radiation, Limited, to acquire the ordinary stock of the company has now been made unconditional.

BAMFORDS, LIMITED, agricultural engineers and ironfounders, of Uttoxeter (Staffs)—It is announced by Neville Industrial Securities that the offer for sale of 1,000,000 4s. ordinary shares at 5s. 6d. per share has been heavily oversubscribed. Lists were closed on June 26.

KEITH BLACKMAN, LIMITED, engineers and manufacturers of fans, etc., of London, N.17—For the year to March 31, 1958, the dividend on the £600,000 ordinary capital is raised by 2½ per cent. to 17½ per cent. Profits were £425,003, before completion of audit, compared with £342,239. From this figure is to be subtracted £232,850 (£190,845) tax. A year ago there was deducted from the balance pre-acquisition profits of a subsidiary of £19,610.

HUNSLET (HOLDINGS), LIMITED, holding company for locomotive designers and manufacturers, including underground mining locomotives—Applications have been made to the London and Leeds Stock Exchanges for a quotation for the 1,200,000 5s. ordinary shares and £300,000 6½ per cent. debenture stock 1978-83. Arrangements are in hand for the placing of 352,250 5s. ordinary shares and £210,750 6½ per cent. debenture stock 1978-83.

W. & T. AVERY, LIMITED, weighing machine manufacturers, etc., of Birmingham—The company is maintaining the dividend on the £2,733,370 ordinary capital at 15 per cent. with an unchanged final of 10 per cent. for the year to March 31, 1958. Application is being made to the CIC to capitalize reserves by a free scrip issue of ordinary at the rate of one-for-two. Group profit for the year is £1,226,617 (£1,247,239) after tax of £1,281,861 (£1,298,279).

FERRANTI, LIMITED—The company has obtained CIC consent to £1,500,000 of general reserve. Ordinary holders are to receive one fully paid 5½ per cent. third cumulative preference £1 share for every £2 of ordinary stock and one fully paid ordinary 10s. share for every 10s. of ordinary stock held on July 24. The ordinary capital is privately held. The chairman, Sir Vincent de Ferranti, reports that last year's output was over £24,000,000, of which some £15,500,000 was sold at home.

RUSTON & HORNSBY, LIMITED, engineers, oil and gas engine manufacturers, etc., of Lincoln—Group trading profits totalled £2,107,789 (£2,043,288) for the year ended March 31, 1958. With profits on contracts completed in previous years and trade investment income, the total is £2,414,205 (£2,414,818). The net balance is £645,684 (£693,956) after £120,000 (same) for plant replacement, and with subsidiaries retaining £139,680 (£81,300), the parent's net profit is lower at £506,004 (£612,656). The dividend is repeated at 9 per cent.

VOKES, LIMITED, filtration and silencing engineers, of Guildford (Surrey)—The company has agreed to acquire all the 24,000 issued £1 ordinary shares and the 1,000 employee 1s. shares of Robert Kellie & Son, Limited, iron and brass founders, etc., of Dundee, against the allotment of 300,000 ordinary 4s. shares of Vokes. The directors forecast that the final distribution on the ordinary 4s. capital as increased for the year to June 30, 1958, will not be less than the 17½ per cent. final rate for 1956-57, which included a 5 per cent. bonus. An unchanged 7½ per cent. interim has already been announced.

YORKSHIRE COPPER WORKS (HOLDINGS), LIMITED—A 6 per cent. interim is announced for the year to July 31, 1958, the same as for the previous year. As stated in January, this interim is based upon results for six months to January 31, 1958, the date on which the merger with the metals division of Imperial Chemical Industries, Limited, took place. It should not, therefore, be taken as any indication of the results for the first six months of the new organization or of the final dividend. Accounts for six months to January 31, 1958, are being prepared and will be forwarded in due course. Since the merger, trade has fallen off, otherwise integration has proceeded smoothly, it is stated.

Allied Ironfounders' Smaller Sales

Sales of Allied Ironfounders, Limited, are, in the current year, running below last year's levels, says Mr. W. T. Wren, chairman; but when conditions improve the company "will be more than ready and equipped" to meet the demand. Existing domestic appliances are being improved and others designed. Sales were down because "fortunes of the group are almost entirely linked with housing" and some 30,000 fewer houses are due to be built this year compared with 1957.

The company is continuing its own direct efforts to encourage the replacement of out-of-date grates, stoves, and boilers by the installation of the modern convector type of appliance. Regarding exports, Mr. Wren says that total sales are down on last year, except in the heavy-duty cooking division where progress is being made. For 1957-58 group net profits of £849,340 compare with £745,429, and the 12½ per cent. dividend is repeated.

Morgan Crucible Company contemplates Incentive Plan

Expanding range of markets and products may enable the company to keep its business on a level keel in 1958-59, although the current trends in industry discourage optimism for the future, states Mr. P. Lindsay in his annual report as chairman of the Morgan Crucible Company, Limited. Nuclear Graphite, Limited, in which the company is associated with the A.E.I.-John Thompson Nuclear Energy Company, Limited, is expected to begin the machining of high-purity graphite for use in nuclear-power plants in October.

In an endeavour to improve overall productive efficiency, the introduction of a new and far-reaching incentive plan is contemplated. The group net profit is £948,904 (£1,034,827).

ALLIED IRONFOUNDERS, LIMITED—Mr. R. G. Elliot has resigned from the board.

RANSOMES SIMS & JEFFERIES, LIMITED—Mr. J. S. Canning has been appointed to the board as a non-executive director. He joined the company in 1934.

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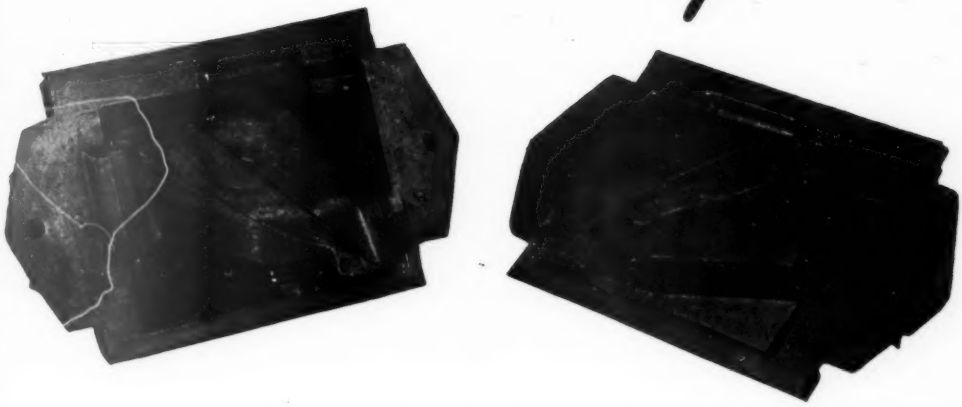

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New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d.)

793,356. Stewarts and Lloyds, Limited, 41, Oswald Street, Glasgow, C.1, Scotland.

A method and apparatus for continuously casting metal bars, billets and the like, providing positive easily-regulated feeding of the molten metal to the mould, also an improved method of preventing sticking of the metal in the mould.

794,037. Birmingham Small Arms Company, Limited, Small Heath Works, Birmingham, 11.

Die-casting and injection-moulding machines of the oil "hydraulic" type. The main objective of the patent is to speed up the operational cycle of these machines.

794,255. British Iron and Steel Research Association, 11, Park Lane, London, W.1.

This invention relates to the continuous casting of high-melting-point metals, such as steel, employing an upstanding tubular mould, into the top of which the metal is continuously poured, and from the bottom of which the partly-solidified casting is withdrawn.

794,296. Winkel Machine Company, Inc., Watervliet, Michigan, USA.

This invention is concerned with the automatic casting of such parts as battery sections. It provides for a mould body and chain-type conveyor construction in which the mould body can be quickly mounted on, and removed from, the conveyor.

794,493. A. S. Beech, and Foundry Equipment, Limited, both of Linslade Works, Leighton Buzzard, Beds.

Improvements in foundry mould-making machines of the type which has a means for effecting a squeezing operation to compress the moulding material in a pattern and also has means for stripping the mould from the pattern when the operation is completed. In particular this improved machine does not require a pit as there are no projections extending below floor level. (See also Patent No. 748,551, FOUNDRY TRADE JOURNAL, June 14, 1956).

New Test-house at Beardmore's

A section of the new test house at the Parkhead Forge, Glasgow, of William Beardmore & Company, Limited, steel manufacturers, was opened at the end of last month by Mr. G. J. Thomas, principal engineering surveyor in Scotland for Lloyd's Register of Shipping, who performed the opening ceremony by starting a 100-ton testing machine. Also to be installed is a Quantometer, and Mr. J. M. Mowat, research director, referring to this, said that it would greatly accelerate the speed with which steel samples are analysed; time would also be saved by the transmission of the analysis back to the melting shop by teleprinter. It would mean that in future, a task which would have taken 20 or more minutes by ordinary laboratory techniques, would take just over a minute. The Quantometer, the first to be built in Britain, is expected to be in operation in the next three months.

In the autumn, the firm are to open a large electric melting plant at Parkhead, and the test house, which will cost £75,000 when completed, will be co-ordinated with this.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference BSB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone : CHAncery 4411, ext. 738 or 771), unless otherwise stated.

NORTHLEACH, GLOS, August 11—Provision and laying of the following lengths of water mains and all relevant fittings: Spun-iron flexible jointed pipes, 7,740 lin. yd. 7-in. dia.; 1,670 lin. yd. 4-in. dia.; and 4,900 lin. yd. 3-in. dia. Documents from W. Herbert Bateman & Partners, Chesterfield House, Batheaston, Bath. Deposit £3 3s. 0d.

OLD FLETTON, PETERBOROUGH, July 30—Supply and laying of approx. 2¾ miles of spun-iron water mains, varying in diameter from 12 in. to 4 in. Documents from G. B. Kershaw and Kaufman, 82, Victoria Street, Westminster, London, S.W.1. Deposit £5 5s. 0d.

BUCKINGHAM, July 28—Providing and laying about 2,400 yd. of 6-in. and 4-in. stoneware and spun-iron pipe sewers, manholes, etc. Documents from D. Balfour & Sons, 131, Victoria Street, Westminster, London, S.W.1. Deposit £5.

PENISTONE, August 8—Construction of spun-iron pipe sewers, 6-in., 9-in. and 12-in. dia., with manholes, and about 200 lin. yd. of spun-iron rising main, 4-in. dia. Documents from A. H. S. Waters & Partners, 25, Temple Row, Birmingham, 2. Deposit £3 3s. 0d.

RUGBY, July 14—Supplying and laying approximately 683 lin. yd. of 6-in., 273 yd. of 8-in., 3,317 yd. of 9-in., 2,447 yd. of 12-in., 55 yd. of 18-in., and 47 yd. of 24-in. dia. spun-iron water mains. Documents from Borough Engineer and Surveyor, Burford House, Rugby. Deposit £2 2s. 0d.

BRIGHTON, August 23—Supply and erection of three submersible well pumps and five booster pumps at Mile Oak pumping station for the T.C. Deposit £5 5s. 0d.

PICKERING, YORKS, July 24—Construction of 6-in. dia. cast-iron water main, 6,017 yd. long, in the Parishes of Marishes and Thornton Dale. Documents from Mr. J. W. Carter, Clerk of the Council, 38, The Mount, Potter Hill, Pickering, Yorkshire. Deposit £3 3s. 0d.

LITHERLAND, LANCS, July 14—Supply of the following in connection with 37 dwellings to be erected at Ford: Cast-iron rainwater goods, soil pipes and fittings. Applications to the Engineer and Surveyor, Town Hall, Litherland, Liverpool, 21.

THAILAND, August 15—Water pumps; centrifugal and electric. (ESB/16494/58/ICA.)

PAKISTAN, July 22—Pump and engine units, pipes and tubes. (ESB/16653/58/ICA.)

CANADA—Beatty Bros., Limited, Fergus, Ontario, are interested in receiving quotations and literature from UK manufacturers of cast-brass male adaptors for plastics pipe. (ESB/15627/58.)

SOUTH AFRICA—Dryden Engineering Company (Pty.), Limited, P.O. Box 815, Johannesburg, wish to get into touch with UK manufacturers of all types of machine tools. (ESB/15306/58.)

PANAMA—Inversiones Generales, Apartado 3122, Panama, are interested in representing UK manufacturers of cast-iron water pipes, either bell and spigot type or with a mechanical joint, and car number-plates. (ESB/16405/58.)

PERTH—The Council's Register of Contractors prepared to submit offers for water main or sewer laying or construction of water or sewage works is to be revised shortly. Contractor wishing to be placed on the new register, should apply direct to the County Water and Drainage Engineer, 3, South Street, Perth, stating the type of contract (major or minor water mains or sewers) and areas in the County for which they wish to be considerel.

Increases in Capital

ASQUITH MACHINE TOOL CORPORATION, LIMITED, Halifax, increased by £300,000, in 5s. ordinary shares, beyond the registered capital of £1,050,000.

REAY BRASS FOUNDRY COMPANY, LIMITED, Stockton-on-Tees, increased by £45,000, in £1 ordinary shares, beyond the registered capital of £5,000.

BRITISH INDUSTRIAL TOOL SUPPLIES, LIMITED, Lye, near Stourbridge, increased by £19,900, in £1 ordinary shares, beyond the registered capital of £100.

GOODLASS WALL & LEAD INDUSTRIES, LIMITED, London, E.C.2, increased by £2,000,000, in 10s. ordinary shares, beyond the registered capital of £6,000,000.

THOMAS FLETCHER & COMPANY, LIMITED, engineers, etc., of Mansfield, increased by £50,000, in £1 ordinary shares, beyond the registered capital of £100,000.

R. H. H. FRANKS, LIMITED, general engineers, founders, etc., of Chertsey (Surrey), increased by £55,000, in £1 ordinary shares, beyond the registered capital of £10,000.